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Shallow Draught River Steamers*

By Charles Ward

IT IS generally conceded that, in many respects, the present-day river passenger steamer is much behind those of 40 or 50 years ago in speed and comfort. In fact, it is a common remark that while there has been tremendous improvement in deep-water and trans-Atlantic steamships, little improvement has been made in our river steamers. This is partly true and partly untrue. The conditions of today are entirely different from those of 50 years ago, and call for facilities of another character.

Under any circumstances, the western river steamer stands in a class alone, and cannot be judged by the same standards as deep-water craft.

It is the purpose of this paper to present the peculiar character of our river steamers in a general way; taking up each part—that is, the hull, the machinery, and its performance, as far as possible, so that its merits, from an engineering and navigating standpoint of view, may be considered in detail.

The production of the river steamer has not developed in the ratio of our engineering knowledge, as applied to other up-to-date steamers. There are few yards where two or three steamers are under construction at the same time. They are frequently built on the river bank, and, when the hull is finished, it is slipped or launched sideways into the river. Generally the hull is built by one man or firm, the engines by another, and the cabin by a third party. In this there is seldom any accurately-made design, drawing or calculation of weights and displacement. Engines do duty on three or four hulls, and sometimes the cabins are moved over onto a new hull. Quite recently, a very fine new hull has been built of creosoted wood and a new cabin put thereon, but the engines, 16 in. by 5½ ft., and doctor, said to have been built during or before the war, have been re-installed on the new boat, it being the third hull on which they have done duty.

From an engineering standpoint it is regrettable that very little data of the actual performance of western river steamers are available. No speed and power trials are ever run, so far as the writer's knowledge goes. A boat's speed is estimated by her progress up-stream (seven, eight, nine or ten miles up-stream, with no definite agreement as to what the stream is, which, in fact, may be from one to three or four miles as an average current and from four to eight or nine miles in certain places), still there is a general average of speed up-stream, which the western boatman appreciates, that is by no means intelligible to an engineer.

Horsepower is seldom considered in western river parlance. A boat's power is, in its vernacular, 10 in. by 30 in., 12 in. by 48 in., 16 in. by 5 ft., 14 in. by 7 ft., 20 in. by 8 ft., etc., all of which are accepted proportions of the engine's cylinders. Work done by a western towboat is rated by the number of empty coal barges she will tow up stream, which is sometimes fined down by giving the time from one point to another up-stream, with a given tow of so many empty barges.

The writer has been asked to submit a proposal for a towboat to take so many barges up the Mississippi river at four miles an hour, when there was stated to be a current of four miles, and at certain points a current of eight miles. No data could be found as to the horsepower required to push a given tow at any speed. Most of the loaded tows are simply floated and steered downstream, but by figuring the displacement of the tow down and the corresponding calculation of the return barges, I found that in this section a towboat could bring back one-sixth of the displacement she took down the river, but to get a horsepower ton-mile is out of the question.

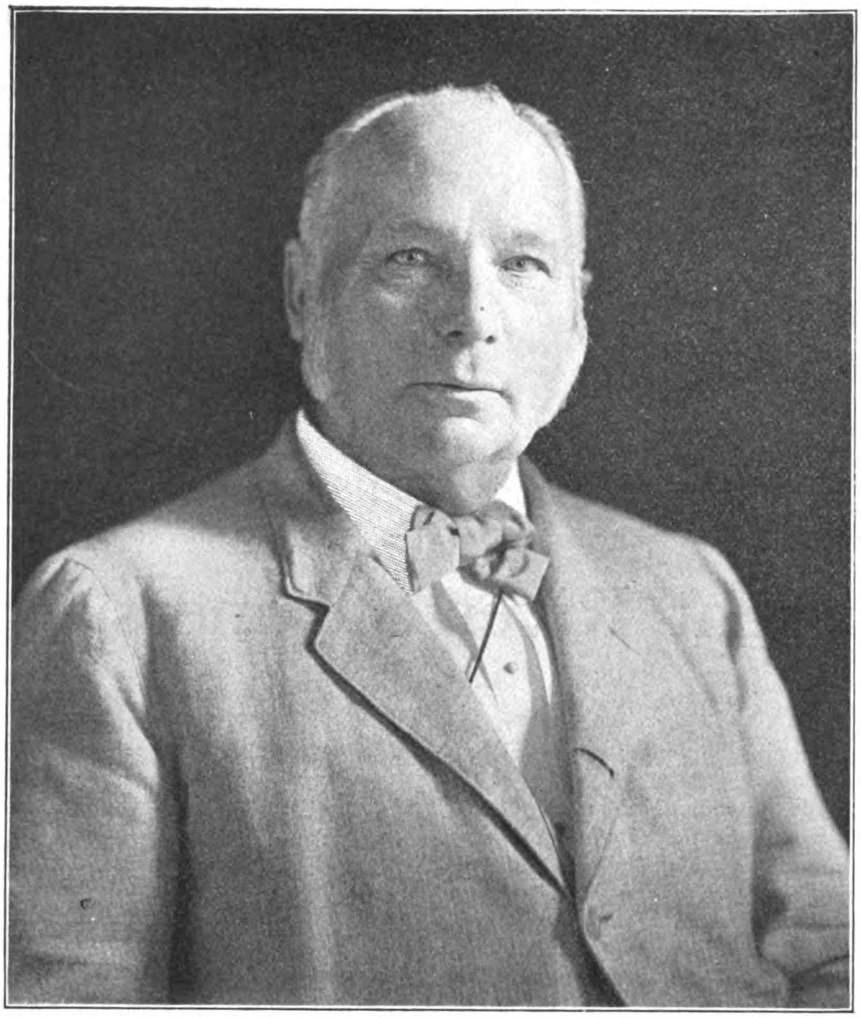
With such conditions, it is difficult to handle a subject of this nature in a manner comparable with engineering standards. I shall, therefore, now present, very briefly, the general features as they exist today, commencing with the hull.

Hulls.

In perhaps 90 cases out of 100 the hulls are of wood. There has been a prejudice that a wooden hull stands the service better than an iron hull. In some cases the hull and main deck have been of steel, but the bottom sheeting has been of 4-in. oak. Steel, however, is here asserting its superiority as elsewhere, and now there are several steel steamers on the western rivers.

To further consider the hull, I may say that they are invariably flat bottomed, with vertical sides and a more or less modeled bow, having considerable flare with a view to get the current rather under the boat than around

*Abstract of a paper read at the summer meeting of the Society of Naval Architects and Marine Engineers, held at Detroit, June 20, 1909.



MR. CHARLES WARD.

it. The stern is very full with a transom nearly full width of the boat to sustain the heavy stern wheel which is carried by wooden or iron beams, secured in pairs on the outer edges of the hull. One of these beams extends aft of the hull to carry the large paddle-wheel; the other beam lays on deck on the extreme side of the boat. Each pair of these beams rests on about one-fifth of the length of the boat at the stern and takes bearing and support from the several frames they cover.

A system of braces connects the deck and floor frames and these beams together. This trussing forms the engine bed and its foundation, to which the entire engine, including cylinders, slides and shaft bearings is secured. While the whole thing looks, and is limber, it has the advantage of covering a large bearing on the water. The whole hull is to an easterner very fragile, but with careful loading, and the novel system of chaining and bracing, it has met the requirements of the case. In building the same form of hull in steel, a much more efficient system of bracing is necessary, as the same amount of flexibility would strain the seams and bring on trouble.

Rudders.

The rudders of a stern-wheeler, two or more, like everything else about the boat, are peculiarly suited to the conditions and are of the balanced type, the balance extending well under the stern of the boat, and the after end reaching out to, and just clear of, the wheel. Sometimes the rudder stock is vertical and the bottom of the boat formed to clear the rudder, but more generally the rudder is hung with the top of the post pitching forward, in which case the forward part of the rudder is formed to clear the boat. The peculiarity of the position of the rudders forward of the wheel was doubtless brought about by the difficulty of placing the rudders aft of the paddle-wheel. This peculiarity diminishes the power of the rudders when going ahead, but increases it when the boat is backing. While often useful, this makes it necessary for the boat to stop and back in order to secure the desired position going forward. In towing, this peculiarity has proved quite useful. With a large tow, in short bends of the river, there is often not room enough to steer the tow around these curves; then it becomes necessary to stop and back strong, checking the progress down stream. At this time the rudders are very powerful and move the stern of the boat sideways, while the current tends to move the head of the tow in the opposite direction, and, at the same time, float it around the bend. This is called flanking.

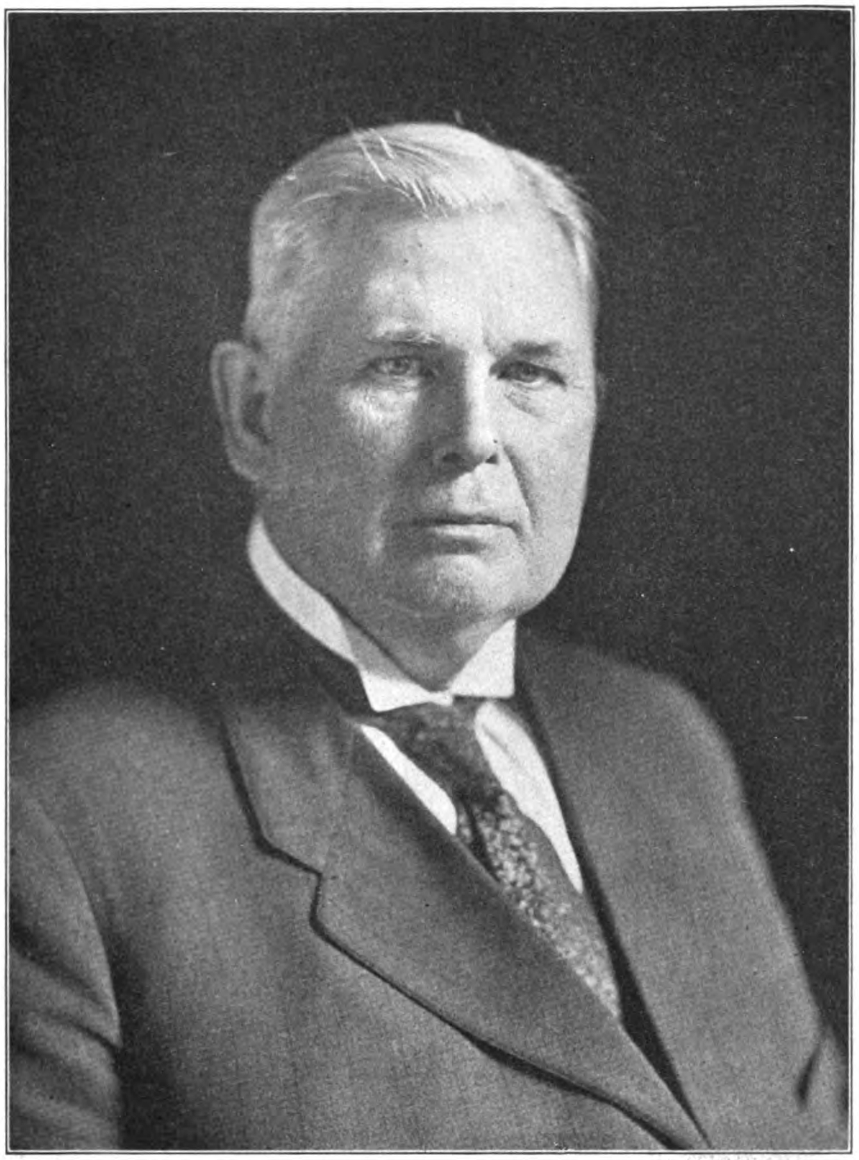
Boilers.

Boilers are sometimes tubular and occasionally of the locomotive type, but more generally of the cylindrical flue type, ranging in diameter from 30 to 40 in., and in length from 15 to 30 ft. The generally accepted form is the two-flue type, with fluse ranging from 12 to 16 in. in diameter. When weight is of prime consideration, five or six flues are used. Flues are always riveted to the heads, even when a large number of small flues are used.

When arranged in battery, which is general, except in very small boats, these boilers are connected together transversely by two mud drums underneath and a steam drum above—all firmly riveted together, with tubular connections flanged and riveted to the boiler and the drums, making a common water-line and one compact piece, which lays over a large area of the deck, covering a large number of deck frames and displacement. In this particular they are suited to the conditions, as their weight is distributed over a large surface. Very heavy foundations are not required. Being externally fired, the fire-box and fire-bed are formed of sheet iron, lined with firebrick, with very slow combustion chambers. The gases of combustion pass under the boilers and return through the flues to the breeching and smoke stack. The draft is increased by the exhaust from the engine or by steam jet blowers, which are fitted to each flue, however many there may be. I need hardly to say that the latter is a very extravagant way of increasing combustion.

Steamboat men think flue boilers are the thing. They are suited to the accompanying conditions for the following reasons:—

Their simple construction keeps first cost down; their small diameter admits of high-pressure steam without thick plates; they are accessible for cleaning and work muddy water fair-



MR. STEVENSON TAYLOR, VICE PRESIDENT OF THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS.

ly well, though there is frequently trouble from this source.

They stand forcing—an evaporation of 8 to 10 lbs. per square ft. of heating surface being common practice. They are not, however, economical in fuel, but furnish the steam when pushed, and they are usually pushed. Owing to the large amount of water they contain, they are steady in carrying water and have a large heat-storing capacity, which equalizes extremes of steam supply and demand, yielding its stored energy in emergencies.

Owing to the large area at and about the water-line, variations of water lever are slow and water is consequently easily carried. Their great weight unfits them for light-draught boats, but it comes in useful as a counterbalance to the large paddle-wheel hanging over the stern, and being productive, is much better than the rock in the otherwise empty end of the meal sack.

The boilers being situated at one end of the boat and the engines at the other, a water level indicator, having a float in the boiler and a dial on the aft end thereof, shows the water-line many feet away. As a further security, a gage cock is opened by a lever, to which a cord is atttached from the engine room; on raising the lever, the engineer knows by the harmonics if water or steam blows.

Engines.

The earlier engines were of the simplest possible construction, of the slide-valve type and had a stroke of about four times the diameter of the cylinder. The cylinders were cast with the parts in one piece, the valves being operated by the usual eccentrics and link motion. Owing to the great length of the long-stroke engines, and the unavoidable distance from the cylinders to the crank-shaft, very long eccentric rods and pitmans were necessary. The large surface of the slide valves, with the high steam pressure, made them hard to move, and caused the eccentric rods to spring. This, together with the limber hull, which changed its line by different loading, caused uncertain valve action, which gave more or less trouble, especially when, as frequently occurred, the boilers primed and muddy water was carried over into the valve box, causing the valve to groan and cut. To correct this difficulty, another form of engine, known as the lever-poppet-valve engine, was adopted. It has many desirable features and is well thought of, and in general use to this day. In its simplest form, the cylinders are made with two nozzles on each end. The steam passages, or side pipes, as they are frequently called, are cast separate and fitted to the cylinders. The valve chambers are immediately on the nozzles, one at each end for the live steam, and likewise the exhaust, consequently the ports are very short and clearance is reduced to the minimum. These poppet valves are raised and lowered, each by its respective lever—the latter being operated by a rocker shaft, which in turn is controlled by a full-stroke cam. The engine is operated by changing the hook of the cam rod to the reverse position. A second cam called the cut-off is furnished, and this is designed to cut off the steam at the point desired—usually one-half, five-eighths, or three-fourths of the stroke. Each engine is mounted on a pair of beams, always of wood, until recently, when iron or steel beams have gradually come into use. These beams are generally called cylinder timbers. It is no unusual thing to hear steamboat people speak of iron cylinder timbers.

These beams, being in pairs and very long, reach over many of the boat's frames, to which they are secured. A system of trussing with numerous bolts connects these beams, the deck beam, and the floor timbers together. One of these beams extends out beyond the hull to receive the shaft and wheel. On these two beams, the entire engine and wheel are carried.

Man hath sought out many inventions for providing an adjustable cut-off for poppet-valve engines—among the first and more generally used is that known as the California or Cross cut-off. This device is used in connection with the regular levers,

and consists of a wedge to each lever, which is inserted or withdrawn to change the time of dropping the valve. It is operated by a pendulum actuated through a sliding arm on the cross-head, the usual cam motion being used for handling. Another adjustable gear is that known as the Rees, which is used on many steamers built by the James Rees & Sons Co. Movement is obtained from the cross-head by pendulum, much the same as in the California cut-off, but the arrangement manipulating the valves differs. The builders have different methods of applying this gear.

In a more recent adaptation, the main valve gets its movement from a wrist and a small connecting rod coupled to the main pitman. This, through a rocker arm, operates the main valve, while the cut-off is actuated by a pendulum from the crosshead.

D. M. Swain, of Stillwater, Minn., has successfully introduced many novelties in machinery for both stern and side-wheelers. His boats are reputed to be very fast and economical. I regret that I cannot submit drawings of the valve motion, which, like two or three others, takes its movement from the pitman. Mr. Swain's specialty appears to be cross compounds for stern wheelers, the high pressure on one side and the low pressure on the other. In side wheelers he puts the high pressure forward of the paddle and the low pressure aft. This gives a more uniform effort to the wheel and greater economy. The engines are of the inclined oscillating type.

Messrs. Gillett & Eaton, of Lake City, Minn., have made improvements in steamboat machinery, using piston valves for both the main valves and the adjustable cut-off. The piston valves have snap packing rings. The engines are built simple, cross, or tandem compound.

Mr. H. F. Frisbee, of Cincinnati, O., has done much in improving various valve gears for western river boats, and I am pleased to be able to submit beautiful wood engravings, showing a cylinder 15 in. in diameter, having 6-ft. stroke with poppet valve and special gear, which, it is claimed, works one-third stronger than the ordinary lever engines. The receiving valves are 5 in. in diameter and the exhaust valves 6 in. diameter. These engines are installed in the stern-wheel boat Tacoma. She was built in 1897 and has done most excellent work.

CAPT. W. J. BAXTER, SECRETARY-TREASURER SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS.

Wheel and Shaft.

Stern and side paddle-wheels on the western rivers are almost always built of wood, this material being more easily repaired. Iron frames are lighter and have other advantages, but for river use where there are submerged logs and rocks and frequently much floating timber and ice, the wheels are often damaged. A few spare wheel arms, braces and buckets are carried and easily and quickly replaced at the first opportunity.

The shaft, which is either iron or steel, the former frequently preferred, is hexagon throughout, except at the bearings and the seating for the cams. Three or more cast iron, or occasionally steel, flanges are keyed on the shaft. These have radial recesses on their sides to receive the wheel arms. These radial arms are braced at two or three points in their length and are further strengthened by curved sections of flat iron bolting all up together. The buckets are secured to the arms by stirrups and plates, so they may be slipped in or out slightly, to better adapt the wheel to the power of the engine.

The question as to the best dimensions and form of the paddle-wheel is a much mooted question. No single rule applies in all cases; in stern wheel the length is largely determined by the width of the boat, and the diameter is such as will give the desired travel when the engines are turning at the permissible revolutions. These in small and medium sized boats run from 25 to 35 R. P. M., in larger boats from 10 to 25 R. P. M. I undertand the Sprague does most of her work at about eight revolutions, sometimes less. As long-stroke, slow-moving engines, when coupled to a shaft at right angles, do not balance, the wheels are built with buckets of uneven weight and sometimes of vari-

able surface, the greater resistance being put where the power is greatest, and the heavier buckets placed to balance the irregularities of the power.

In side paddle-wheels, where there is an independent engine to each wheel, they are not only weighted, but the buckets are narrowed at the points of least power, so that the wheels are oval shaped.

A simple, general, average rule gives one bucket for each foot of the wheel's diameter. This makes the buckets a little over 3 ft. apart, which, in average sizes, works out nearly right.

The very large majority of paddle-wheels on our rivers is of the radial type. While feathering paddle-wheels are used most commonly abroad, I know of but one instance on the Mississippi river and its tributaries. This is the small U. S. stern-wheel launch Lucia, designed under the direction of Major Mackenzie. Paddle-wheels have a slight advantage over the screw-propeller wheel, in that they are more accessible, and their diameter and surface are easily increased or diminished by changing the position and the width or length of the bucket. The buckets are frequently divided in their length, one-half being set one-half a space in advance of the other, giving more even and continuous bearing on the water.

A prominent superintendent in the east has put himself on record as stating that paddle-wheels give a more comfortable boat than the screw-wheel. This, however, depends much on the depth of the water and the quality of the practice in both cases.

One great objection to the paddle-wheel is its great weight. The wheel of the great Sprague, including its shaft, is said to weigh 160 tons, notwithstanding the fact that the shaft has a 21-in. hole through its center. Hollow shafts in this practice do not seem to be satisfactory. Some boats have had two, with unsatisfactory results, which are now replaced with a solid shaft. Iron ones are still favored by many.

Doctors and Heaters.

The so-called doctor is, in reality, a walking beam engine, fitted with two vertical, cold-water, single-acting piston pumps, and two hot-water plunger pumps, having pot valves in each case. Above the framing of the engine are carried two cylindrical heaters, one for each engine to exhaust into. The cold-water pump takes water from the river and discharges it, either over a series or perforated plates, or through a coil into these two heaters. This water, thus partially heated, is taken by the two hot-water plunger pumps and fed to the boilers. The exhaust steam from the two heaters is conveyed through a long exhaust pipe to the smoke-stack, where it discharges, through reduced nozzles, to increase the chimney draft. This produces a back pressure in the exhaust pipes and the engines of from 4 to 6 lb. The feed-water pipe is carried through the long exhaust pipe to the boilers and on its way becomes heated to nearly the boiling point. This heater system is about the only enconomizer, and is one of the *very good* things on the boat.

Since the day of direct-acting pumps, much fun has been poked at the western doctor, but it is a very efficient, though a heavy and clumsy means to an end.

It is very singular that while the eastern practice may ridicule the walking-beam doctor, they do not see the much greater beam in their own eye—the side-wheel-beam engine, which the westerner would not think of using. The doctor, nevertheless, despite its great weight, has its advantages. It is much more economical in the use of steam than a duplex plunger pump. The plungers, being vertical, are suited to pumping water containing mud and sand. The valves are plain, strong, easily ground, tight and accessible, and the wear and tear is little.

Steam Pipes, Throttle, Etc.

The steam pipes, quite long, lead from the steam dome to the engine-room on the center longitudinal line of the boat and are bent downward to the position of the main throttle valve; the latter is mounted on a stand which travels on rollers to and fro, according to the expansion and contraction of the long steam pipe or the change of line of the hull due to different loading or excessive waves. From the throttle valves two branch steam pipes pass, by long and easy bends, up, then overhead and down to the engines. From the position of the throttle, the engineer stops, starts, ships up and unships the cut-off by means of a system of levers, without moving from the throttle. The engines on a stern-wheel boat, being connected to the shaft at right angles, start readily.

On side-wheel boats the throttle valve is at each engine, one being operated by the engineer, the other by his assistant, known as striker.

When the engines are stopped, the poppet valves of the engines are raised, allowing the steam to blow through the engines; this relieves the boilers and keeps the engines warm, ready to start again.

Compound Engines.

The accepted compound engine for western river practice is that known as the tandem type, though some builders prefer the cross compound. In Europe the latter is more generally used, and when used for stern-wheelers is placed in the middle of the aft end of the boat. The wheel shaft is divided with a crank on each inside end. These cranks, at right angles, are connected by a drag link. The engines are set on an inclined bed, one pitman being connected to each crank.

The tandem compound lends itself to the American system, as it is placed in the same manner as the simple engine—on the cylinder beams. The pistons of the high and low-pressure engine being on the same piston rod, the balancing of the work in each cylinder is not important, and the cylinder ratio may be increased to use high-pressure steam—say a ratio of 1 to 5 or 6—with one tandem compound on each end of the shaft. The work may be varied by throttling, each engine doing equal work.

In the cross compound, the cylinder ratios should be such as to equally divide the work between both cylinders, and this ratio does not properly admit of very high initial pressure, the largest ratio being about 1 to 4, whereas in the tandem it may be 1 to 6, which gives better results.

While the compounding of these long-stroke engines gives a more economical use of steam, when properly designed and installed they are very much heavier and take up valuable room on the boat and when used in connection with condensers this condition becomes more aggravating.

The average western river paddle-wheel engines, whether simple, compound, or compound-condensing, are many times heavier and more cumbersome than engines of the same class used in connection with screw-wheel propellers.

The foregoing applies to the several classes of western river steamers, tow-boats, passenger steamers—stern or side-wheelers. All side-wheel boats are passenger steamers. All tow boats are stern-wheelers, but all stern-wheelers are not towboats. In the upper rivers, the stern-wheel boats preponderate, whereas in the lower rivers, where water is more abundant, side-wheelers prevail. It is in the larger boats that compounding of the engines is more general.

Notwithstanding the admitted econ-

omy of the compound engine, there is a very general conviction among steamboat men that the increase of weight and complications mitigates any benefits that accrue from their use.

Personally, I am convinced that should the simple cylinders of these boats be made larger and a suitable short cut-off be used, the same power may be obtained on about one-half the fuel now used. Some time ago we had an opportunity to indicate the engine of a stern-wheel boat, the engines being 16½ in. diameter and 5½-ft. stroke. The initial pressure was 205 lb. cut-off at three-fourths of the stroke. The terminal pressure was 143 lb., thus wasting more steam than was utilized.

It may seem incredible, but this is general practice in many packets, and nearly all towboats.

Work and Horse-Power.

I desire to speak of the work done under existing methods. It is almost impossible to obtain any data of horse-power and work resulting. We, however, some few years ago, took cards of a towboat having cylinders 20 in. by 8 ft., when towing 17 empty barges, each 125 ft. by 26 ft. drawing about 1 ft., and one fuel boat, up-stream, the current being estimated at three miles per hour. The speed of the boat passing the shore was 3 2/3 miles, the actual speed being 6 2/3 miles per hour. The card herewith shows 210 lb. initial pressure, 188 lb. mean effective pressure, and a terminal of 148 and 194 lb., respectively, the revolutions being 14 per minute, equalling 786 I. H. P., but think what might have been attained if the steam, which was released at a mean of 171 lb., had been utilized.

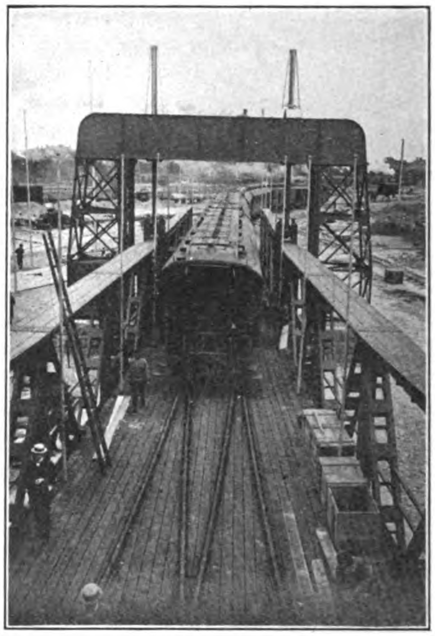
Who will say after this that the western river boat is what it ought to be?

Mr. Ward concluded his paper with a discussion of the passenger packet boat and the tunnel boat, which of late years he has developed and which he believes to be, when carefully designed and properly built, much superior to the paddle-wheel steamers now in use, having all the backing and handling qualities of the stern-wheel boat with greater economy.

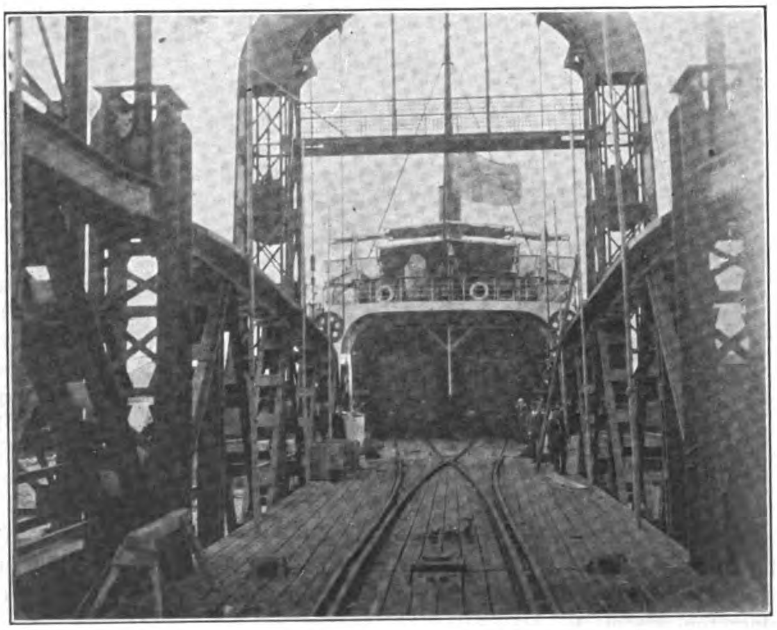
Car Ferry Drottning Victoria

THE reputation of the Tyne as the birthplace of all manner of sea-going craft was upheld by the production of the sea-going railway train ferry steamer Drottning Victoria which departed on Tuesday, June 22, from her builders' yard, the Neptune Works, Newcastle-on-Tyne, of Swan, Hunter & Wigham Richardson, Ltd., for Sweden, where she goes to take up the service between Trelleborg and Sassnitz, under the ownership of the royal administration of the Swedish state railways. She is one of four similar ferries, two belonging to the Swedish state railways, and two to the German government. The two latter are being built in Germany, and of the two former the other is under construction in Sweden.

These ferries are entirely a new departure. Railway train ferries have been known for many years, indeed so long ago as 1864, the old firm of Wigham Richardson & Co. built at the Neptune Works a ferry for carrying trains across the Rhine, and in 1871 they built the train ferry Lillebelt, one of the first, if not the very first of the numerous fleet of train ferries, plying in Danish waters in connection with their railway service.



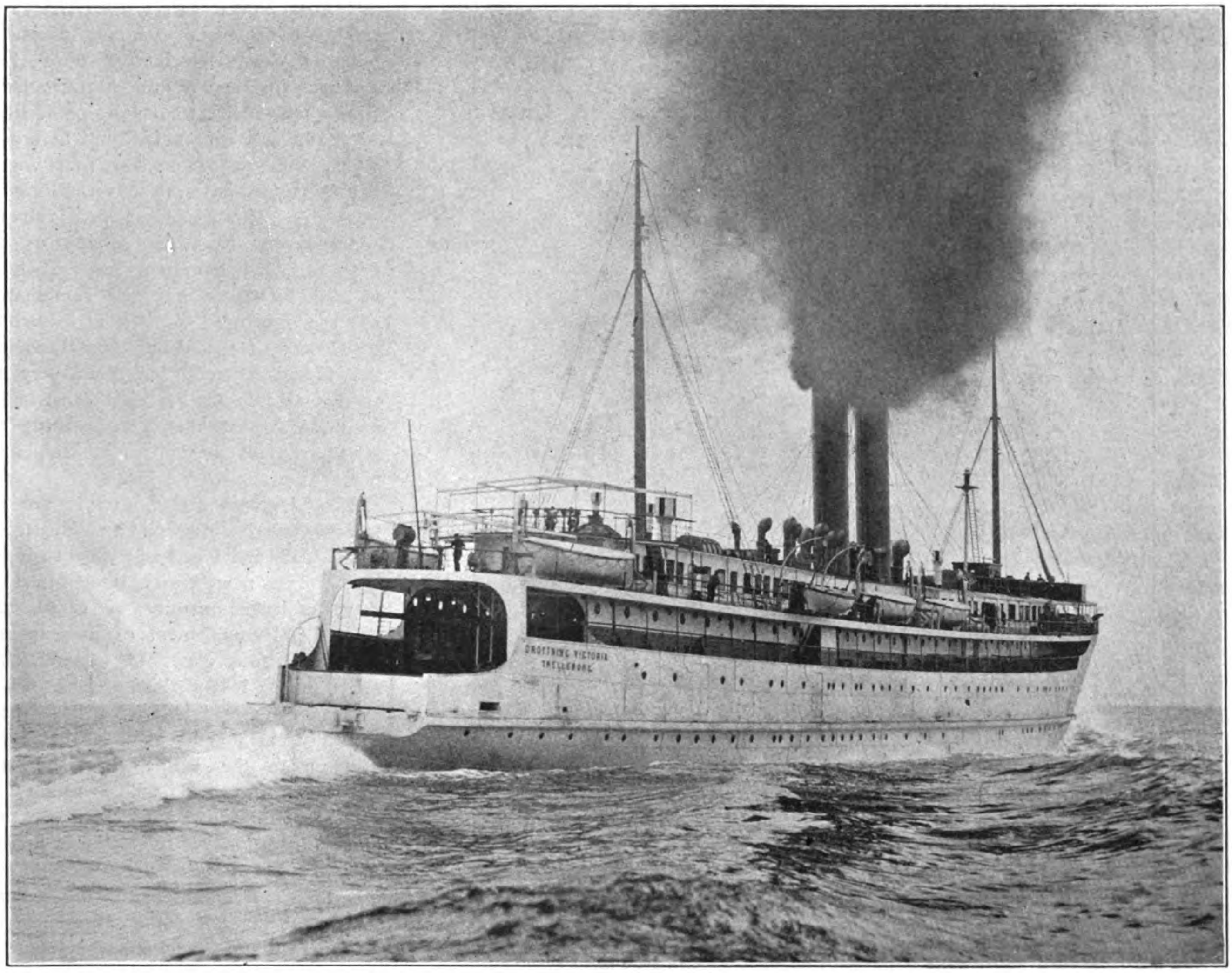
View Looking From the Train Ferry Showing Corridor Coaches Traveling Over the Bridge Toward the Car Deck of the Steamer.



Showing the Method of Embarking and Disembarking the Cars.

Hitherto such steamers have travelled in smooth or comparatively smooth water, but the Drottning Victoria has been built to carry trains across the open sea, and across a sea which is certainly not always smooth. This contingency has, however, never been lost sight of either in the design or construction of the vessel.

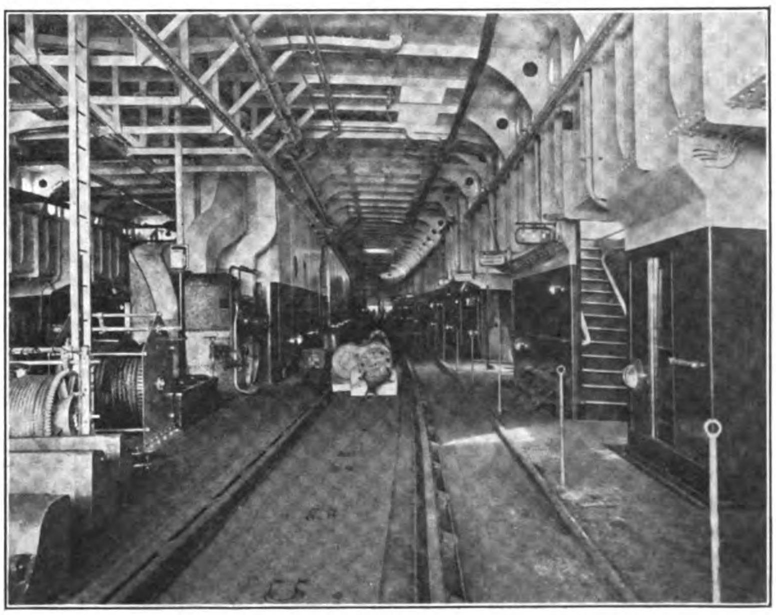
The vessel herself is built with very graceful lines, and has the stern open to receive the trains which stand in two lines on the car deck, the entrance to which can be closed by doors when at sea. Specially constructed landing stages have been formed, exactly fitting the form of the vessel, whilst to assist the vessel in getting into position quickly, she has been fitted with a bow rudder as well as a stern rudder. Once the cars are on board they will be held in position by many screws and ring plates attached to the deck, and by spring buffers at the end. The whole of these fastening appliances being of the most carefully thought out design, and of the most powerful description.



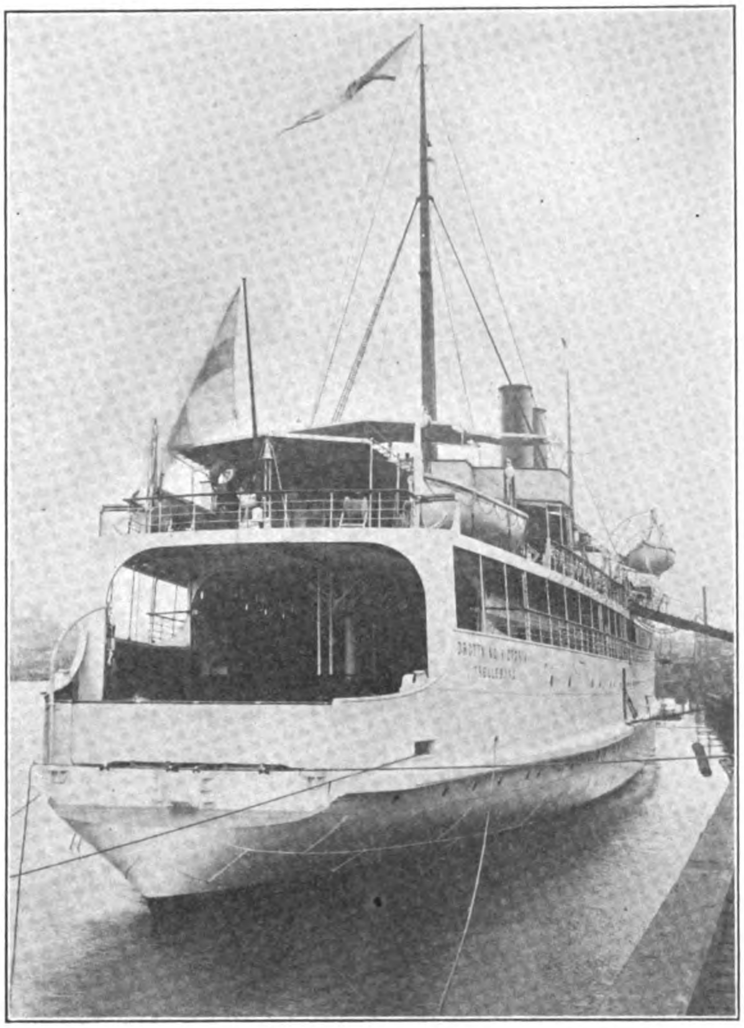
THE TYNE-BUILT TRAIN FERRY STEAMER DROTTNING VICTORIA.

The stability of the vessel and her behavior in a seaway have been carefully considered. There is a very complete system of trimming tanks, and specially large bilge keels are fitted. The safety of the vessel is also increased by the adoption of the Stone-Lloyd system of closing the doors in the watertight bulkheads, submarine signaling, ample boats and life saving appliances, the former fitted with Welin davits. The navigation and the maneuvering of the vessel are facilitated by the large number of telegraphs which are fitted. Indicators on the bridges show the navigating officer the direction of the rudder, the trim of the vessel, the number of revolutions of the engines, etc., in addition to the usual steering, docking and engine telegraphs.

The Drottning Victoria not only carries trains, but she also caters for the large number of passengers who are not traveling in the long distance trains. She has first class staterooms for about 100 passengers, besides accommodation for a large number of other passengers. The day rooms of the first class passengers occupy a fine deck house above the car deck, and comprise spacious dining saloon, ladies' room, lounge and smoke room, as well as a long covered promenade for wet weather. The whole of the furnishings and upholstery of these rooms is of the most comfortable description.



CAR DECK OF THE DROTTNING VICTORIA.



STERN VIEW OF DROTTNING VICTORIA.

The staterooms are situated below the car deck aft.

In addition to the ordinary first class staterooms, there is a regal suite of rooms, the latter being on the saloon deck.

The steamer is 370 ft. in length by 51 ft. beam, and has about 300 ft. of double track on her car deck. She is driven at a speed of over 17 knots per hour by twin-screw, triple-expansion engines, which with the boilers have also been built at the Neptune Works of Swan, Hunter & Wigham Richardson, Ltd. On trial trip the stipulations as to speed, power, etc., were considerably exceeded.

Mr. Pegelow, director-general of the Swedish state railways, represented the royal administration of the Swedish state railways on the trial trip and other directors of the Swedish state railways were also present as well as Mr. Hök, under whose supervision the vessel has been built.

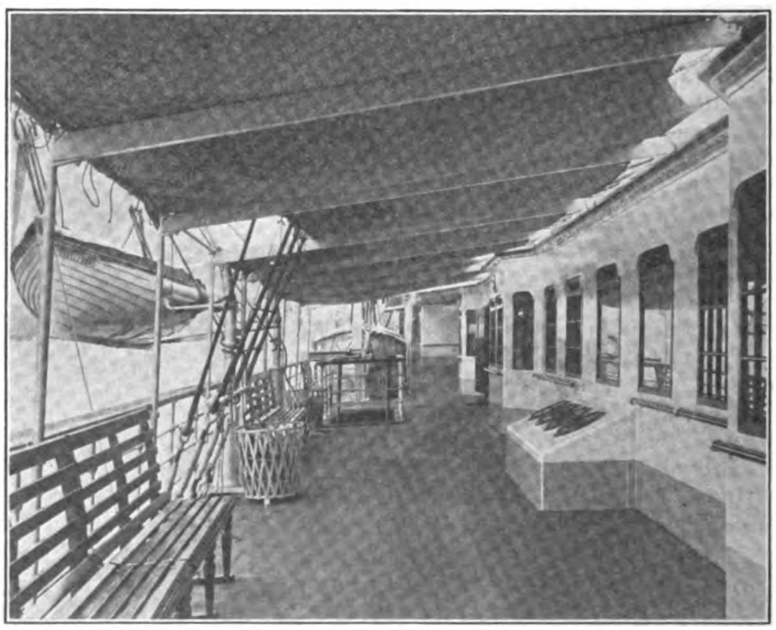
The supreme court of California has decided that Terminal Island or West Long Beach, whose municipal parentage has been in litigation for several years, belongs to San Pedro.

WHITE STAR LINER MEGANTIC.

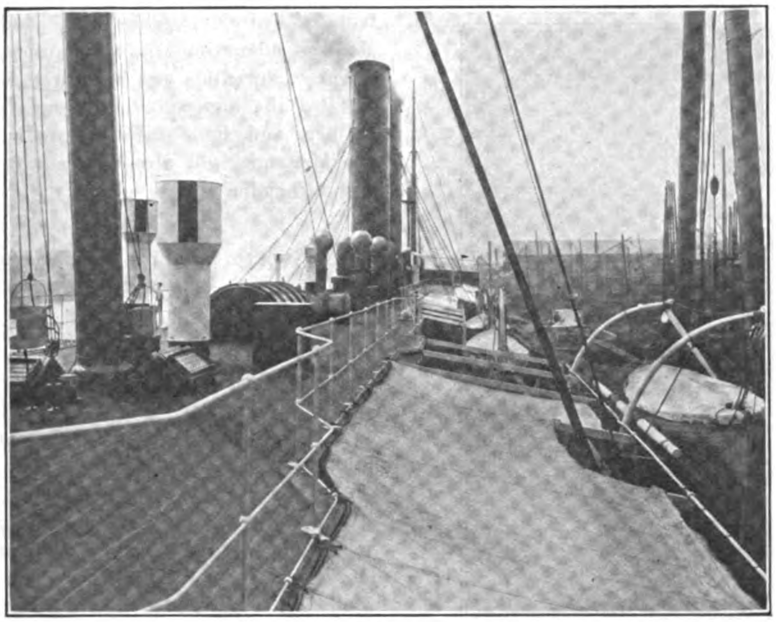
The twin screw steamer Megantic, built by Messrs. Harland & Wolff, Ltd., Belfast, for the White Star-Dominion Line, left Belfast Lough on Friday, June 4, and proceeded to Liverpool, whence she sailed on her first voyage in the Canadian service on Thursday, June 17. The Megantic, as is already well known, is a sister ship of the Laurentic, but has twin screws, whereas the Laurentic has the combination of reciprocating engines and turbine. The entry of the White Star Line into the Canadian trade has been very fittingly signalized by the construction of these two steamers, representing the latest triumph in the art of shipbuilding.

The Megantic and Laurentic are the largest vessels in the Canadian trade, being 565 ft. long and about 15,000 tons. The new vessel is designed to carry a large quantity of cargo, and also a full complement of passengers—about 260 first class, 430 second class and over 1,000 third class. The passenger accommodation has been carefully arranged, and is in every way up to the White Star standard. The entrances and public rooms, as well as the staterooms, will be admired not only for their artistic decoration, but also their height and roominess. In addition to the general comfort insured by the luxurious appointments and spacious character of the rooms and promenades, every other possible provision has been made, and many popular devices adopted to enhance the comfort and pleasure of the passengers.

In the Atlantic service few things are more important than efficient ven-



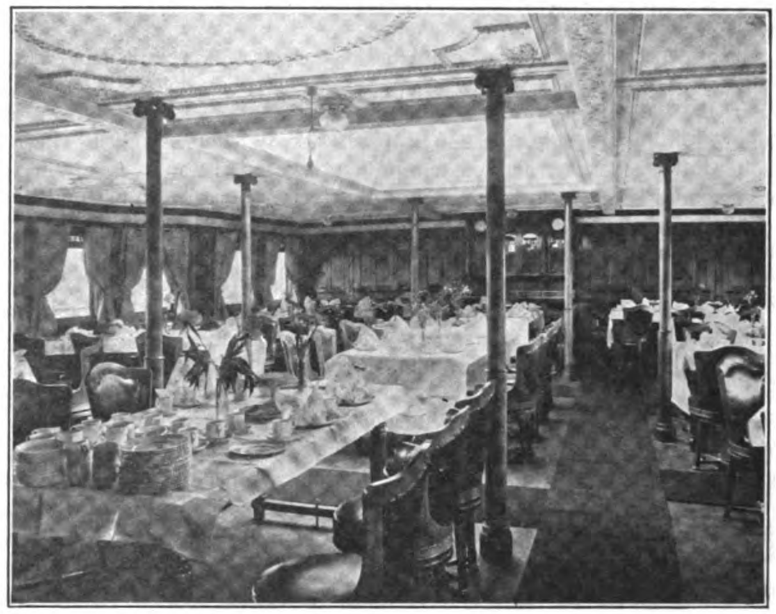
PROMENADE DECK OF THE DROTTNING VICTORIA LOOKING FORWARD.



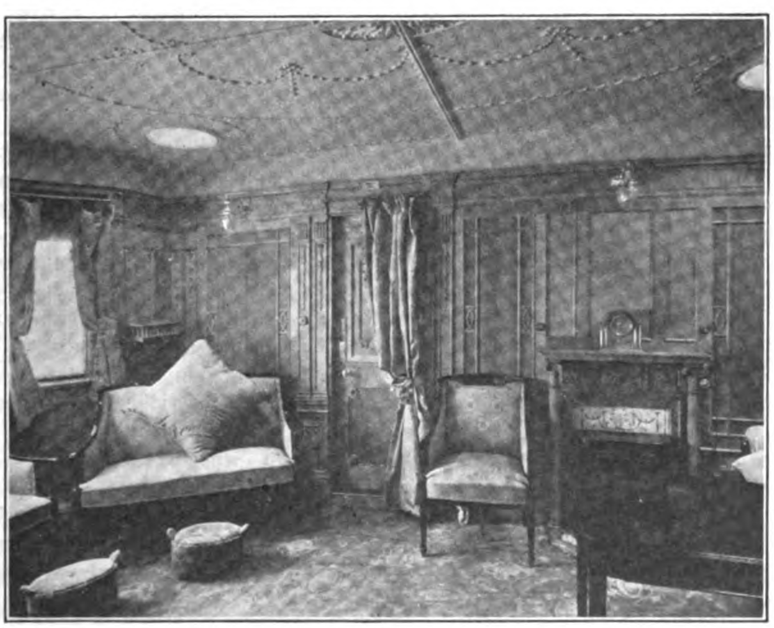
BRIDGE DECK OF THE DROTTNING VICTORIA.

tilation and heating. In the new ship these important elements will be found to be entirely satisfactory. The ventilating system provides for the circulation of a constant supply of pure air throughout the various compartments by means of powerful, electrically-driven fans. Particular attention has been given to the public rooms and dining saloons to insure their freshness. The vitiated air is extracted, and the free admission of fresh air is induced. The system is under complete control, and can be adjusted at any time to suit all climatic changes. The heating will be effected both by steam and electric appliances, so arranged that the temperature of the passengers' and public rooms, as well as the saloons, can be regulated independently. It is worthy of special mention that the electric heaters in the first class staterooms will be under the control of the passengers, who may therefore regulate the temperature to suit their own requirements.

Then the luxuries supplied in the Megantic are on the most generous scale. Each first class stateroom is fitted with a portable electric reading lamp, in addition to the ordinary fixed lamps; there is a complete system of electric bells throughout the first and second class accommodation, and there is an electric passenger elevator between the saloon and upper promenade decks. Each first class stateroom is furnished with a wardrobe, a chest of drawers and a handsome double folding lavatory. All upper beds in these staterooms on the lower promenade deck are Pullman or folding beds; and in a number of the rooms on this deck, and also in the suite rooms, there is an extra wide bed four ft. in width. Full-length mirrors form a feature in the suite rooms, which are specially decorated. The second class staterooms, which are similarly fitted to those for first class voyagers, are arranged for four and two persons. The first class staterooms are situated in a deckhouse on the lower promenade deck, and also forward on the shelter deck. There are a number of cabins en suite, with private bathroom and lavatory adjoining each suite. These staterooms are upholstered in blue moquette, the decoration consisting of small white panelling, and the ceiling is of lincrusta, all white.

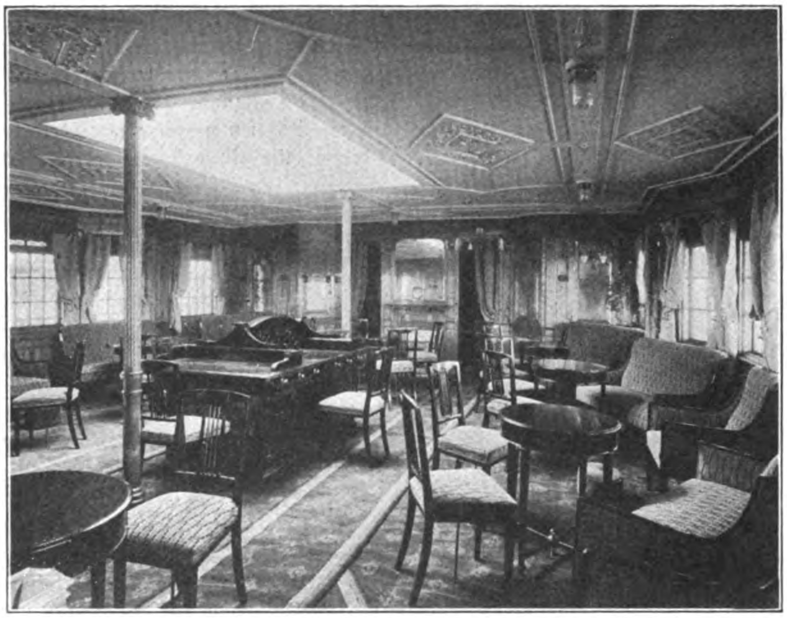


DINING SALOON OF THE DROTTNING VICTORIA.



THE REGAL APARTMENT OF THE DROTTNING VICTORIA.

The principal feature in the decoration is, of course, the treatment of the chief public rooms in the vessel, namely, the first class dining saloon, the reading room, the lounge and the



WRITING ROOM OF THE DROTTNING VICTORIA.

smokeroom. The first class dining saloon is a handsome apartment. Situated on the saloon deck, it extends the full width of the ship. It is exceptionally lofty and airy, and contains seating accommodation for 212 people. It is panelled in the stately fashion of the time of Charles II, and is painted chastely and simply with a delicate and ivory-like white. This room has the popular "well" arrangement overhead, with verandas for the bandstand, and the tables are arranged on the restaurant principle. Over the vertical sliding sidelights are handsome iron grilles and leaded lights—a useful and artistic combination, insuring fresh sea air without drafts.

On the upper promenade deck is the reading room, a charming apartment. The walls are decorated in the Adam style, with delicate ornaments in low relief. The floor is parquetry. The furniture is inlaid birch; the carpet is crimson Axminster, and the large mullioned windows complete the artistic character and symmetrical beauty of the room.

The lounge is also on the upper promenade deck. The oak panelling of this apartment is restful to the eye, and the ceiling panelling is well worthy of notice. A large and well-selected library invites recreation or study. Writing tables afford an opportunity for correspondence, and the comfortable sofas with which the room is amply furnished, the work tables provided for the industrious, the cosy corners for intimate conversation, and the card tables for those to whom bridge appeals, complete the furnishings. The windows contain in stained glass effigies of poets, painters, dramatists, and philosophers.

In the smokeroom (also on this deck) cosy comfort is the keynote of the decoration and furnishing. The walls are hung with stamped leather and adorned with handsome leaded glass windows at the forward and after end, with graceful symbolic figures of poetry, music, sculpture, and painting. The seats are deep and luxuriously upholstered, of a kind to invite the smoker to lazy enjoyment. The rich and mellow tone of the stained glass windows affords a light in which the mahogany seats with their carving and their brown leather coverings fairly glow with a sombre magnificence of coloring.

The second class staterooms are on the shelter deck, and the saloon on the middle deck—a very fine apartment, extending the whole width of the ship, to seat 264. The second class library is on the lower promenade deck, and the smokeroom on the upper promenade deck—both elegant apartments, tastefully decorated in polished hardwood. The second class passengers on this vessel and the Laurentic will find the provision made for their comfort second to none on the Atlantic.

The third class dining room, which is aft on the upper deck, is also an exceptionally good room, extending the whole width of the ship.

The promenade spaces form a special attraction, the fullest advantage having been taken of the vessel's size to provide the pleasurable recreation so much enjoyed by Atlantic voyagers.

The vessel is fitted up with the latest and most improved Marconi system of wireless telegraphy, and has also a submarine signalling apparatus.

The Laurentic on her first voyage fulfilled the highest expectations formed of her, and it is safe to predict that the Megantic will also prove a favorite with Canadian passengers.

ROYAL MAIL STEAMER BERBICE.

The Berbice, the first of the two new twin-screw steamers ordered by the Royal Mail Co. from Harland & Wolff, Ltd., left Belfast on Thursday, July 8, and after adjustment of compasses and satisfactory trial proceeded for the West Indies.

The Berbice is a very interesting vessel, and, although smaller than the large ocean steamers which the Royal Mail Co. have added to its fleet during recent years, is nevertheless a vessel of the most approved design and the latest type. She is a twin-screw steamer 313 ft. long, 38 ft. 3 in. beam, and about 2,500 tons, with two sets of quadruple-expansion engines on the "balanced" principle. The principal decks are of steel, and the vessel has been constructed on the same principles as the largest ocean liners.

The Royal Mail company, in the construction of the Berbice and sister ship, have shown their determination to keep up every branch of their important service in a most efficient manner, and it is safe to assert that these vessels will maintain the company's high reputation in the intercolonial trade. The provision made for both elements of the service, namely, passengers and cargo, has been carefully devised. The advance made in the passenger accommodation will be greatly appreciated, and the arrangements for dealing with cargo are very complete.

The Berbice will carry a large number of first and second class passengers, also deck passengers. The staterooms are large and airy, and provided with electric fans. The first class cabins are in white enamel, which has both a cool and attractive appearance. The second class cabins are also in white.

The first class dining saloon on the main deck extends the whole width of the ship. The sidelights are of large diameter and arranged in pairs, thus insuring ample ventilation, while the provision of jalousie shutters will afford protection from the sun. The ventilation will be assisted by large electric fans.

The bridge deck will be entirely devoted to first class passengers, the lounge being at the forward end and

a verandah at the after end, the latter serving as a semi-enclosed smoking room, cool and comfortable in every way. Both these apartments have large opening teakwood windows, both port and starboard, and wickerwork furniture. In the lounge a piano and bookcase are provided, and on this deck, as also the boat deck above, the first saloon passengers have splendid promenading spaces.

The second saloon accommodation on the main deck, with the dining saloon at the after end, is also of a superior character, and the promenading space for this class, as also for the deck passengers, will likewise be found ample.

The Berbice has electric light throughout, and is also provided with refrigerating plant and insulated chambers.

The advent of this vessel into the service emphasizes the wide extent and importance of the ramifications of this long-established and historic company. As is well known, the Royal Mail Steam Packet Co. is the oldest trans-Atlantic steamship company in existence, having been established by royal charter in 1839. Throughout the 70 years of its career it has maintained and extended its imperial connection. Established for the conveyance of mails from England to the West Indies, and later on to South America, it has been represented on these important trade routes by the most magnificent steamers of their day, and the vessels put on the route during the last few years are truly floating palaces. The company's passenger routes now include not only the West Indies and South America, and other American ports, but the Mediterranean, Egypt, Ceylon, Australia, New Zealand and other parts of the globe.

How Britain Encourages Her Mail Shipping

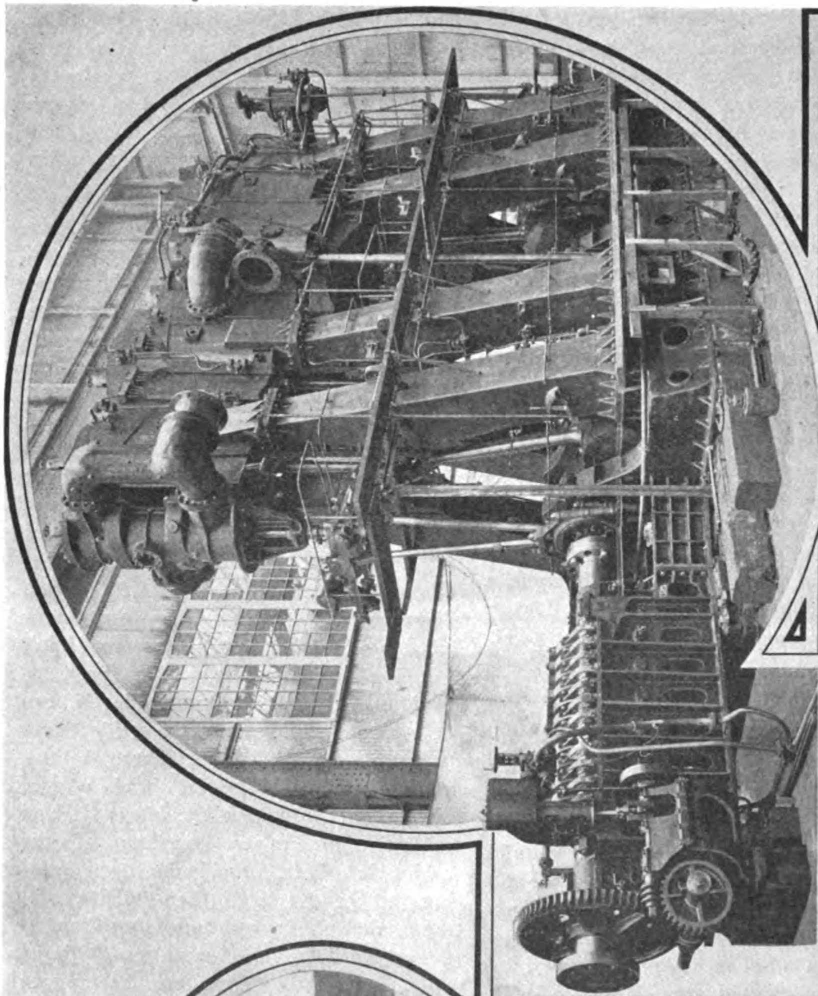
THE Orient Steam Navigation Co. is just now adding to their fleet five new vessels constructed to comply with the conditions of the new mail contract between the commonwealth of Australia and the Orient company, which is to come into force on Feb. 1 next. It is interesting to note in this connection that the Orient company became mail carriers to the far-off British colonies over a quarter of a century ago, and for the earlier contract received $425,000. This sum was increased in a later contract to $600,000, and the amount which the imperial government is to pay for the contract which begins next year is $850,000 per annum, but this latter contract has necessitated the building of five new steamers, each with a gross tonnage of 12,036, or an aggregate of over 60,000 tons, each ship being a great advance on the older mail carriers, notably in size, speed, auxiliary aids and appliances. Of the five new vessels, the order for which was placed in April, 1908, three are practically alike, except in details and in the design of the engines. The first to be completed is the Orsova, which was built by Messrs. John Brown & Co., Ltd., of Sheffield and Clydebank, completed her trials in May, and sailed on her first voyage on June 25. The second, the Otway, has been built by the Fairfield Ship Building & Engineering Co., of Glasgow, and will leave on her first voyage on July 9. The Osterley is being completed by the London & Glasgow Engineering and Ship Building Co. The other two ships, the Otranto and Orvieto, which differ considerably, not only in deck arrangements but also in their machinery, are being constructed by Messrs. Workman Clark Co., of Belfast. These vessels will likewise be completed well in advance of the date for the commencement of the new service, namely Feb. 1 next.

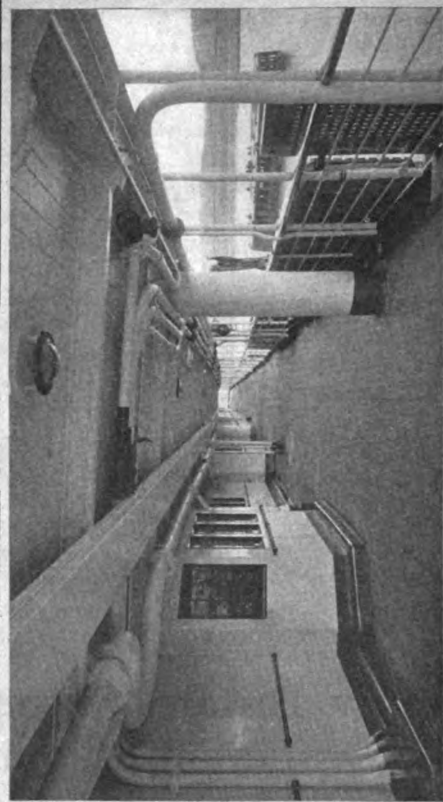
Our illustrations are of the Orsova, the first of the five to complete her trials, and her leading particulars are: Length over all, 553 ft.; length between perpendiculars, 535 ft.; extreme breadth, 63 ft. 3 in.; depth from shelter deck, 46 ft.; depth from top of chart house, 80 ft. 9 in.; gross tonnage, 12,036 tons; main service displacement, 15,100 tons; main service draught, 24 ft. 3 in.; power on trial on service draught, 11,900 indicated horsepower; speed on trial on service draught, 18.1 knots; number of passenger decks, 5; number of first-class passengers, 268; number of second-class passengers, 120; number of third-class passengers, 388; number of officers, engineers and crew, 292; total cargo capacity, 254,000 cu. ft.; estimated d. w. capacity, 5,000 tons.

There are ten watertight bulkheads with cellular double bottoms from the fore peak to the after peak. The space between the double bottom is divided to provide for 1,000 tons of ballast, 500 tons of fresh water for ship's use, and 300 tons of fresh water for boiler-feed reserve. The scantlings conform with Lloyds highest class. The plating is for the most part treble riveted, and the stem is straight, while the stern framing is of the spectacle type. The bilge-keels extend for about 230 ft. of the vessel's length, which ought to make the ship easy in a seaway.

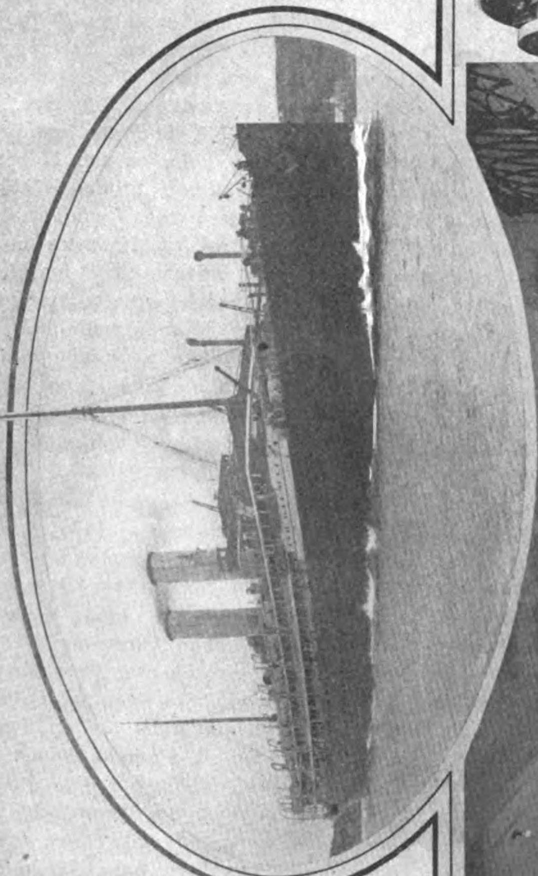
One of the main difficulties in the eastern trade is the great range of temperature through which the ships have to pass on practically every voyage, often from freezing point to 100 deg. Fahr. The ventilation problem is consequently of the first importance, and the Orient company, after long experience, have preferred the plenum system, as the atmospheric air, without treatment for heating or cooling affords the most suitable percentage of moisture for the different climates. The alleyways are all fitted with grille doors, while in calm seas the heavy sidedoors on the openings on the ship's side forming the entrance to the companionway on the different levels can be opened, leaving only the grille doors to pass a current of air. There is thus, when the ship is going ahead, a free circulation throughout the alleyways and cabins. The upper panelling of the cabins has been fitted with open gratings at the top to further assist ventilation, and the cargo and other hatches are utilized to the same end, glazed doors being provided where these pierce the passenger quarters. The feature of the cargo accommodation, however, is the insulated holds, and the arrangement for keeping them at the freezing temperature, the large insulated holds having a combined capacity of about 90,000 cu. ft., two of Haslam's compound dry-air refrigerating machines being provided, each entirely self-contained. The aim in the small holds as well as the large is to minimize the range of temperature, and it has been found that the introduction of the exhaust fan enables the range to be confined within narrow limits.

The propelling machinery was designed to give a speed of 17½ knots with a mean service displacement of 15,100 tons, and to run for 24 hours at not less than 16¾ knots with a coal consumption not exceeding 1.4 lb. per indicated horsepower per hour. These guarantees have been more than fulfilled. With less than ½ in. of air pressure of forced draught—which is on the Howden system—a speed of 18.1 knots was attained in the concluding runs of the series of progressive speed trials on the measured mile, the horsepower being 11,900, and this speed was maintained according to contract for ten hours on the following day. On the coal consumption trials which were





One of the Quadruple-Expansion Engines of the Orsova.
First-Class Promenade Deck of Orsova.



The New Orient Liner Orsova.
First-Class Dining Room of the Orsova.

run on the passage from the Clyde to London, the speed was 16¾ knots, and, notwithstanding that all lights were run and most of the fans, besides the other auxiliaries generally in use, the consumption was well within the guarantee. In other words, the total consumption for the 400 miles steamed during the 24 hours was about 130 tons. The design of the engines is therefore of special interest, and we are enabled by the kindness of the builders to reproduce them. The twin engines are of the quadruple-expansion type, the diameters of the cylinders being 28¾ in., 41 in., 58½ in. and 84 in., respectively, with a stroke of 60 in. They are arranged on the Yarrow-Schlick-Tweedy system of balancing with a high-pressure and low-pressure cylinder forming the first couple, and the second intermediate and the first intermediate the after couple, the valves being on the outside of each pair. The valves are of the piston type, for the high pressure and first intermediate cylinders, and of the double ported slide type for the second intermediate and low-pressure cylinders. The general design, with its independent columns, as shown in the illustration, gives a very open engine. The shafting is entirely of compressed ingot steel, while the crank-shafts are of the built-up type, and are each in two separate double-throw sections. The shafts are 17½ in. in diameter with 18-in. pins. The thrust shafts are also 17½ in., the tunnel shafts being 16¾ in., while the propeller shafts are 17¾ in., covered throughout with a solid gun metal sleeve. The bearers are extra long and the shafting is considerably in excess of that required by the British board of trade. The propellers have each four blades of manganese bronze with cast steel bosses.

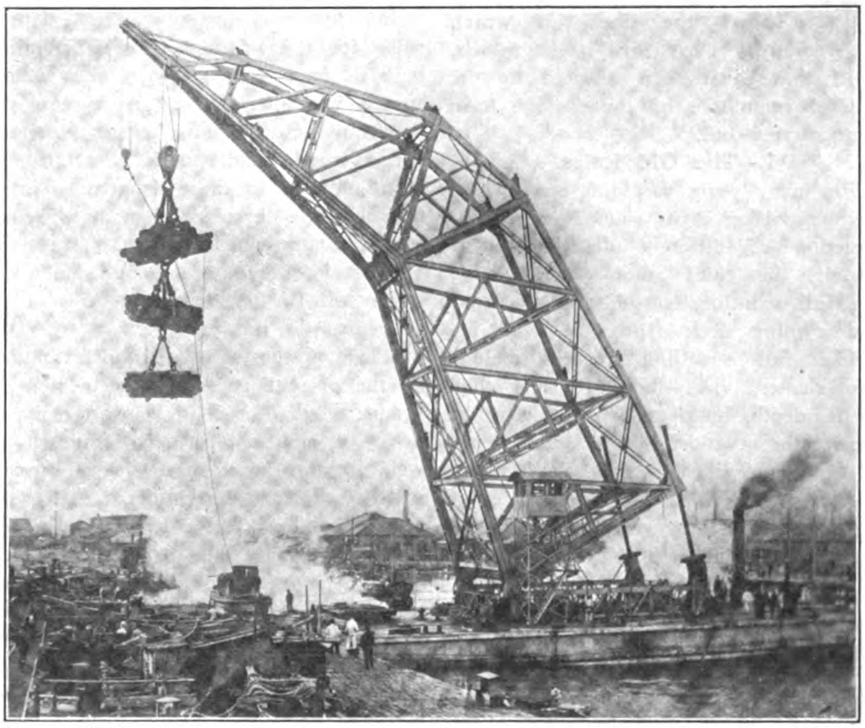
The condensers, which have a cooling surface of 9,000 sq. ft. are entirely separate and placed in the wings. The air pumps and all other pumps are also separate. This separation was adopted not only to assist in the balancing of the engine, but to increase reliability in maneuvering, as with the pumps worked separately there is always a vacuum in the condenser, independently of the action of the main engines, so that the engines start more easily from a state of rest. The air pumps are of the Weir type, each with two 9½ in. steam cylinders, 26-in. water cylinders and a stroke of 18 in. They are placed immediately in advance of the condenser on each side of the ship.

There are four double-ended and two single-ended boilers, the diameter in all cases being 16 ft. 9 in., and the length 20 ft. 3 in. and 11 ft. 2 in. respectively. The furnaces are 3 ft. 4 in. in diameter and of the Brown cambered type. The grate area is 728 sq. ft., and the heating surface 31,370 ft.

The passenger accommodation has received careful consideration and the decoration of the public rooms is pleasing and generally is equal to what one would expect in ships of this class. In many staterooms only single berths are provided, and the great majority of the rooms are only for two passengers. In each room there is an electric fan.

STEAM FLOATING CRANE OF 150 TONS.

A floating crane of unusually large dimensions has recently been supplied complete to the Kawasaki Dock Yard Co., Japan, by Messrs. Cowan, Sheldon & Co., Ltd., of Carlisle.



150-TON STEAM FLOATING CRANE FOR JAPAN.

The crane illustrated herewith is capable of lifting loads up to 150 tons at a distance of 50 ft. beyond the edge of the pontoon, and of derricking same in to a distance of 26 ft. from the jib foot pin, which enables loads to be stacked on the distribution trolleys or deck direct. The distance from deck level to center of jib pulley at maximum radius is 85 ft., which enables the crane to put all the principal loads into a ship of at least 70 ft. beam. An auxiliary set of lifting gear for loads up to 20 tons has been fitted, and arranged to lift at a distance of 10 ft. beyond the main block at maximum radius.

The pontoon, which is built of steel throughout, is 100 ft. long x 70 ft. wide x 12 ft. deep, and is divided into watertight compartments by means of longitudinal and transverse bulkheads. The deck equipment includes two steam winches, two steam capstans, together with all necessary bollards and fairleads.

The bottom frame of the crane, which is securely bolted to the frame of the pontoon, is of lattice construction, and forms the supports for the jib foot and screw pins at each end.

The jib is of the braced design, as shown, and is constructed of rolled steel plates and sections throughout. Every care has been taken to provide for wind forces, in addition to those due to live and dead loads, and the long members have been subdivided by means of counter and transverse bracing.

The main load is lifted on ten parts of steel wire rope, the two ends of which are coiled on two separate barrels. An independent barrel is also provided for the auxiliary lifting gear. The barrels are of cast iron, turned and grooved to suit the ropes, and driven from the engines through suitable gearing. Powerful automatic brakes have been provided for each set of gear.

The radius of the jib is varied by means of two large screws attached to the bottom frame, and driven from the engines through spur and bevel gearing. The screws are of forged steel, 12 in. diameter, and are carried

in large gun-metal collar bearings and swivel nuts.

All the motions are driven from one pair of 12-in. x 18-in. horizontal engines, and are arranged to work at the following speeds: Lifting 150 tons at 5 ft. per minute; lifting 75 tons at 10 ft. per minute; lifting 20 tons at 40 ft. per minute; derricking full range in 20 minutes.

Steam is supplied from a multitubular boiler, 7 ft. diameter by 14 ft. long, constructed to board of trade requirements for a working pressure of 120 lbs. per sq. in., and fitted with best quality mountings throughout. Steam driven feed and bilge pumps have been provided, also a 6-in. centrifugal pump for discharging the water ballast.

The operator's cabin is situated on an elevated framework at the left hand side of the jib, and contains all the necessary lever gear for controlling the crane.

The crane was successfully tested with a load of 180 tons, and has since been constantly at work in placing engines and boilers on board various ships being constructed by the Kawasaki Dock Yard Co., during which time it has given every satisfaction.

The above is the first large floating crane of the type shown which has been designed and constructed by a British firm.

Lloyds Revised Rules for Steel Vessels

THE following memorandum, issued by Lloyds Register of British and Foreign Shipping, shows the lines on which the revised rules for steel vessels, which have just been adopted by the general committee of the society, have been carried out.

I.—The Old Rules.

For many years past this society has made provision in its rules for the construction of different descriptions of vessels, the chief among these being the full scantling vessel, and the spar and awning deck types.

The full scantling vessels include two classes, viz.:—those of less than 24 ft. depth, built under what may be called the two-deck rule, and those of 24 ft. and above in depth built under the three-deck rule.

At the time these rules were adopted they were suitable to the several types to which they referred.

The three-deck ship, by the reduction of 7 from the frame number, received consideration on account of the additional beams fitted in her as compared with those in the two-deck vessel. Spar and awning deck vessels, on account of their light continuous superstructures intended only for passengers or the carriage of light cargo, obtained a further reduction of scantlings owing to their scantling numbers being taken from the main deck.

Of the four types, the two-deck, or full scantling vessel of less than 24 ft. depth, is the only one in which the original rule arrangement has not been materially departed from, as except for the substitution of deep framing, or web frames, for widely spaced hold beams, this type of vessel remains the same as at first.

Vessels built to the three-deck rule, however, differ materially in many cases from the arrangements and method of construction originally approved for them, and even from the methods as afterwards modified and as now provided for in the society's rules.

Originally these vessels were required to have at least two laid decks, and a tier of widely spaced hold beams. Provision is now made in the existing rules for the fitting of deep framing or web frames in place of the widely spaced beams, and for an increase in the transverse framing as a substitute for a wood middle deck.

In addition to these departures from the original "three-deck" mode of construction for which the rules do provide, it has become not uncommon to make still further departures for which the rules do not provide.

Many of these vessels which require by the present rule a complete tier of beams about 7 or 8 ft. below the upper deck, in addition to deep framing or web frames, have these beams spaced widely apart instead of at alternate frames; and while the beams are sometimes fitted at the ordinary distance below the upper deck they are at other times fitted at about the middle of the vessel's depth with a view of modifying the framing requirements. In other cases the tier of beams is wholly dispensed with, the result being large single-deck vessels ranging to 30 ft. in depth. For these departures no provision is made in the rules, and they have to be dealt with by other methods.

If we turn from the arrangements below deck to those above, we find that the deck erections which originally consisted of a short poop, bridge and forecastle placed on the upper deck of the three-deck vessel, are now often joined together so as to form a continuous erection known as a shelter deck.

In the shelter deck vessel we have a type specially suited to certain trades and much in vogue with many owners.

This type again, as now built, varies considerably from its original method of construction; for at first the erections joining the poop, bridge and forecastle, were only light structures intended for the shelter of cattle. At the present time the shelter deck vessel is given practically full scantlings to the shelter deck, which is made the strength deck of the vessel, while in many cases bridges, and occasionally forecastles, are fitted upon it.

In the shelter deck vessel there has thus been evolved from the three-deck vessel a new and distinct type, for the construction of which the rules do not provide.

The spar deck vessel has also gone through many changes. Originally a two-deck vessel, having a continuous structure of light scantlings and intended for the carriage of light cargoes, we now find the spar deck vessel carrying full scantlings to the spar deck, the spar deck made the strength of the vessel, and often covered by long deck erections as in a three-deck vessel.

In addition to the lower deck or hold beams being omitted and compensated for by deep framing or web frames, the main deck is at times dispensed with, and the main deck beams spaced widely apart. For some of these changes no provision is made in the rules.

The development of the spar deck type has led to a re-arrangement of material and scantlings in the structure such as will admit of this type loading as deeply as a three-deck vessel, while retaining scantling that would not in some respects be admitted in a three-deck vessel of the same dimensions. These vessels, however, have performed their work satisfactorily, and this result shows that the scantlings adopted in such cases have been sufficient for vessels loading to the maximum extent allowed by the freeboard tables.

The awning deck type has gone through changes somewhat similar to the spar deck type. Instead of the awning deck being a light superstructure, as originally contemplated, the strength has been transferred from the main deck to the awning deck, and erections have been fitted on the awning deck.

It will be seen from the foregoing

that the tendency has been to bring the spar, awning and shelter deck types to a great extent in line with the full scantling vessel by a redistribution of material, strengthening the topsides, and making in each case the upper deck to be the strength deck of the ship. The loading of spar deck and full scantling vessels has been to a great extent identical, but the loading of the shelter deck type has, however, been restricted on account of tonnage openings.

Taking all these circumstances into account it is considered that there is now no necessity for retaining separate rules for each of the several types referred to.

It would appear to be sufficient if provision were made in the rules for two main types only, one in which the numbers for regulating the scantlings would be taken to the uppermost deck, and this would be the full scantling vessel. In the other the scantling numbers would be taken to the deck next below the uppermost deck as at present is done for the spar and awning deck types, and in this type the watertight bulkheads would stop at the deck next below the uppermost one. This second type may be looked upon as a vessel having a continuous superstructure, but with strong sides and deck as is at present the practice with such erections.

II.—The New Rules.

The revised rules and tables are framed to include vessels up to about 680 ft. in length, and they cover all the vessels previously classed by the society, except the large Cunard steamers Lusitania and Mauretania.

Provision is made in these rules for two main types only, namely (1) the full scantling vessel, and (2) the vessel having a continuous superstructure, such as an awning or shelter deck. In both types the frame number will be taken to the uppermost continuous deck, with a deduction in the awning or shelter deck type of the height between shelter deck and deck next below, provided this does not exceed 8 ft. The continuous superstructure is to have strong sides and deck as is at present the practice, with the watertight bulkheads (except collision bulkhead) stopping at the deck below the shelter or awning deck. The machinery casings are to be trunked to the shelter deck or the machinery space bulkheads extended to this deck.

In computing the frame number no account is taken of the half girth of the midship section as is done in the present rules; such half girth being a measure of the fullness of the midship section only, and not of the entire body of the vessel. A vessel may have full ends and a fine midship section, and thus have a larger capacity than one of similar dimensions with a full form of midship section and fine ends. In this way, under the present rules, a vessel having a larger capacity but with a smaller girth amidships, may yet require lighter scantlings both for framing and plating, than a vessel of the same dimensions but having smaller capacity; and this is known to have occurred in some instances. Many of our fastest vessels with exceptionally fine ends, have very full sections amidships; and this is now the usual practice in vessels of fine form, except with such small craft as trawlers or yachts.

The frame number or "transverse number" is the sum of the molded depth at the middle of the length of the vessel, and the greatest molded breadth. The molded depth is the depth generally used when dealing with the dimensions of a vessel, and there will be no need to correct it for varying rounds of beam, as often has to be done with the present rule depth, which is taken at the middle line. The molded depth can always be readily ascertained for any classed vessel as it is recorded in the register book, and is, moreover, the depth used for freeboard purposes.

By using the full breadth in place of the half breadth in the frame number, a similar addition to either of the dimensions, breadth or depth, will have the same effect on the frame number. By the present basis of scantlings, which uses the half breadth in conjunction with the depth, the latter dimension can only be increased one-half as much as the former to have the same effect on the frame number. It will thus be seen that this basis puts a greater restriction on depth than on breadth, which will be obviated by the new basis.

The rule length is measured from the fore side of stem to after side of post on the upper deck, instead of from after side of stem to fore side of post. This length will, in most cases, agree with the registered length of the vessel, and it is more generally used than the present rule length when dealing with the dimensions of a vessel.

The plating number or "longitudinal number" is obtained by multiplying the frame number by the length as at present.

The proportions of length to depth are taken to the uppermost continuous deck, and in the way of a long bridge deck, making the side plating of uniform thickness up to the strake below the bridge sheerstrake, which sheerstrake for the length of the bridge becomes the main sheerstrake of the vessel. The additions for proportions in way of the bridge are made to the bridge deck plating and stringer, bridge sheerstrake and strake below, suitable provision being made for maintaining the strength of the topsides at the ends of the deck erections. Beyond the ends of a long bridge and right through in way of a short bridge the additions where required are based on the proportions to the upper deck and will be fitted at that deck.

By using the greater length in conjunction with the reduced depth (molded depth) the nominal proportions are increased, that is to say, a vessel which is 13 depths to length on the present basis is about 13½ depths to length on the new basis.

Smaller grades have been introduced into the tables in order to render the increase in weight from one grade to another as small as possible, having regard to the strength required. These smaller grades necessitate the increases in frame spacing to be made by half inches, and make desirable that smaller divisions than 1/20 of an inch be used to insure a slight increase with each grade, otherwise the same scantlings would have to be used for more than one grade. Smaller divisions are obtained by using decimal thicknesses, as has already been approved by the committee in the cases of standard sections for angles, bulk angles, channels, etc., and given on pages 181 to 187 of the rules for steel ships; and the bulb angles, channels, etc., given in the tables are, with few exceptions, standard sections.

In the preparation of the tables of scantlings in the new rules, it has thus been considered of primary importance to depart from the divisions of 1/20 of an inch hitherto adopted, and to substitute for them decimal divisions. The unit selected as best fitting the circumstances of the case is one-fiftieth, or 0.02 of an inch. This will not only simplify the work of the drawing office and of the counting house by reason of the recognized superiority of the decimal system, but it will also serve to bring the British measurements into almost identical correspondence with those adopted by our continental neighbors. It so happens that 0.02 of an inch is, to all intents and purposes, a full millimetre. Already the committee of Lloyds register have adopted these divisions in the preparation of the tables of scantlings for yachts built of steel for the international rating classes, and the result has been so satisfactory as to justify the belief that the application of the same unit of division in the

construction of mercantile vessels will be advantageous to all concerned.

The dimensions of the frames are determined from the tables by using the frame number in association with the depth from the lowest tier of beams to the top of the floors. This arrangement renders unnecessary the introduction of tiers of beams at certain specified depths of ship; for, if a tier of beams be dispensed with the frames will be suitably increased, due to the increased height of the lowest tier of beams, while if an additional tier of beams be introduced the frames will be correspondingly reduced. The terms "ordinary framing" and "deep framing" are consequently no longer used. The present "three-deck" rule is also unnecessary, as the framing receives due consideration when another tier of beams is fitted, without any modification of the framing number as at present.

The spacing of the frames from the after peak bulkhead to the fore peak bulkhead is regulated by the frame number, and amounts to 33 in. in the largest vessels; but in no case does the frame spacing exceed 27 in. from the collision bulkhead to one-fifth the vessel's length from the stem, unless double frames are fitted at that part. In the peaks the frame spacing in no case exceeds 24 in.

There are three framing tables, one giving the dimensions of frames when made up of frames and reversed frames riveted together, another giving the frames when formed of single angles, bulb angles, channels, or channels with reversed frames, the third gives the dimensions and spacing of web frames and side stringers in combination with intermediate transverse frames.

The requirements as to outside plating, decks, etc., are given in two tables, one showing the thicknesses of outside plating, steel decks (other than upper decks), beam stringers, etc., also the scantlings required for short deck erections; the other giving the scantlings of the topsides, upper deck plating and stringer, and of long bridges, for proportions of depth to length ranging to 14 depths.

The beam tables are extended to include larger vessels than at present provided for, and the thicknesses have been adjusted in decimal thicknesses.

There are two tables for double bottoms, one giving the scantlings and the other the varying breadths of margin plate required in each framing grade for the increased framing as the depth to lowest tier of beams increases. The latter also shows the corresponding attachments of gusset plates, etc., at the margin plate.

The other tables have been amended, and care has been taken to increase the riveting efficiency wherever experience has shown it to be necessary.

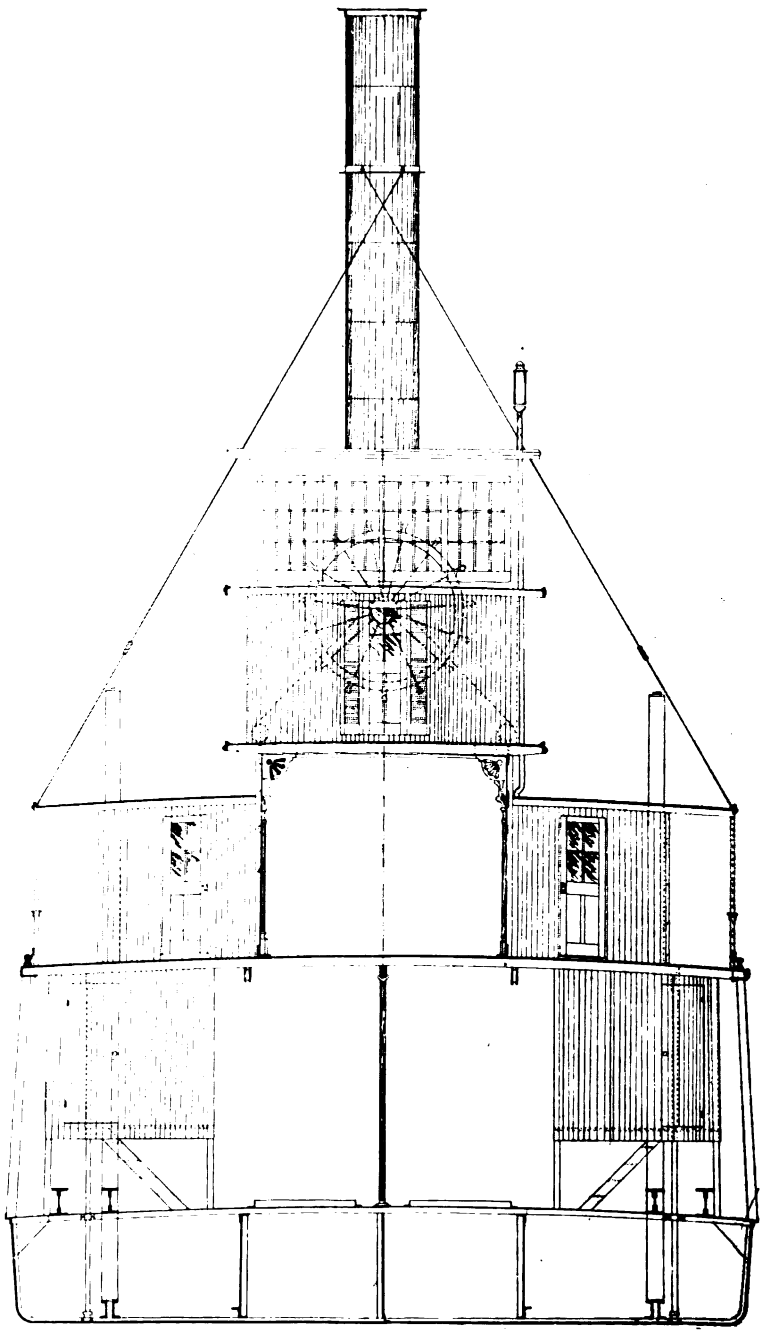
The text of the rules has been rearranged, and rewritten so as to conform with the tables as amended.

The rules and tables provide scantlings for only one grade of classification, viz.: 100A, but should a vessel be built with suitable scantlings, but not quite equal to those required for the 100A class, she may, if the committee approve, be classed 90A.

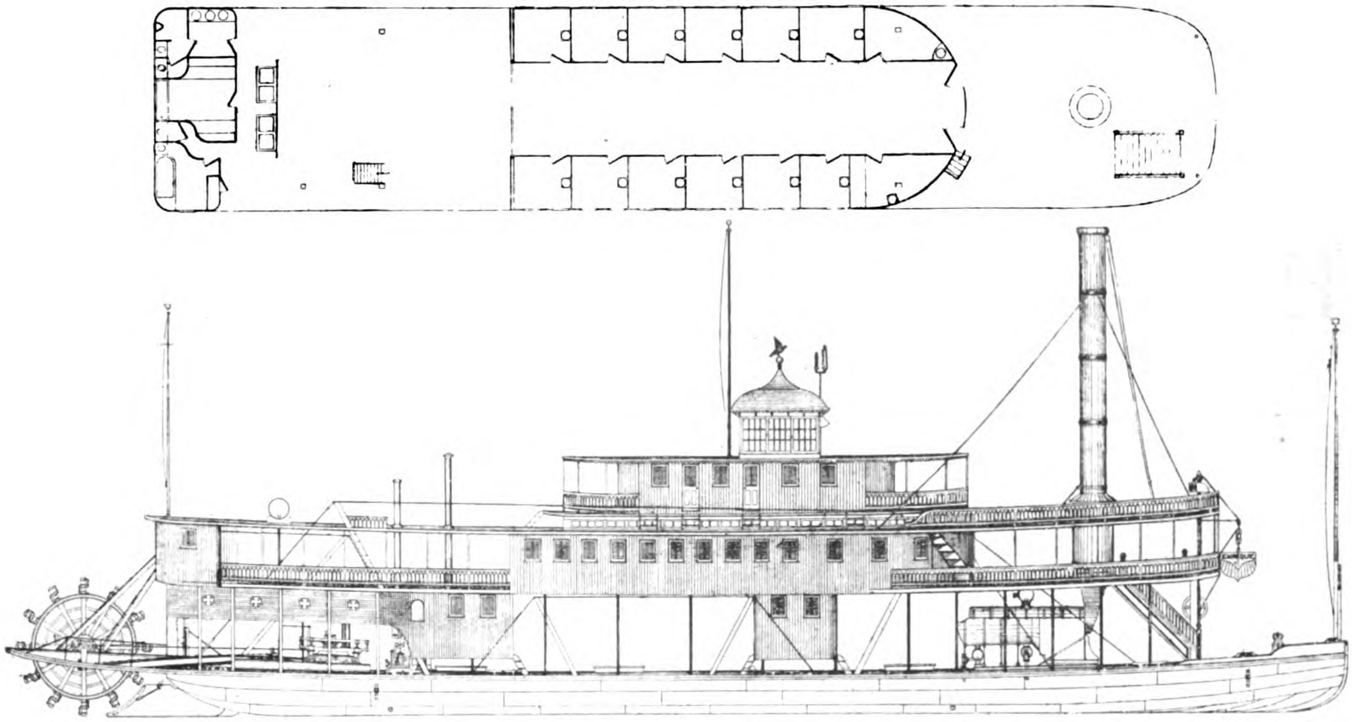
In addition to the revision of the rules for the construction of cargo and passenger vessels, rules have also been prepared for the construction of vessels intended for carrying petroleum in bulk, these rules being based upon the society's long-established practice in the classification of such vessels.

Shallow Draught River Steamers for South America

CLIMATIC conditions in South America have provided an important market for steel hull steam boats designed for freight and passenger service upon the local streams. Craft of wooden construction are, it is said, so affected by the climate as to make



CROSS SECTION LOOKING FORWARD.



PROFILE AND DECK PLAN OF RIVER STEAMER.

rebuilding compulsory within five years, while the useful life of a steel hull steamer is put at from 15 to 20 years, though why this should not be greatly extended is not quite clear. Many of the important vessels now plying on South American rivers are products of the United States, and a number of them were built in ship yards located in practically inland cities. This, however, is not so strange as might at first appear, since the development of the light draught river steamer has reached a high point on the inland streams.

The manner in which these boats are first laid out, erected, and then taken apart and shipped, and finally again assembled upon the banks of the river which they are to navigate, appeals to the mechanical mind and reflects credit upon the skill of the builder. A large steel hull river boat, embodying the latest improvements of its type, has just been shipped to Barranquilla, Republic of Colombia, by James Rees & Sons Co., Pittsburg, and another similar vessel is in course of construction at the company's works. The steamer recently shipped was first erected at the Pittsburg plant of the Rees Co. and each part was numbered and stamped. It was then taken apart and shipped by rail to New York, thence by steamship to the South American coast, where it was again transferred by rail to the banks of the Magdalena river at Barranquilla, where it was finally erected and launched. This is the usual procedure in making shipment from Pittsburg, and the company's method of marking the different parts is so thorough that little difficulty is encountered by those to whom the boat is consigned in erecting the craft without aid from the builders.

Standard lines are followed in the design and construction of a steam boat, subject, of course, to slight variations in detail as sometimes desired by the purchasers. The boat recently completed and the one under construction embody the latest features of their class. The length on deck is 170 ft. and the beam 33 ft. The molded depth is 4 ft. 6 in., with 3 ft. 6 in. sheer forward and 2 ft. aft. There are three I-keelsons or longitudinal bulkheads and five athwartship bulkheads, giving a total of 21 watertight compartments. The bottom plates are 8½ lb. and side plates 7 lb., of open-hearth steel, with double riveted butts. After fitting, the plates are taken down, galvanized, then replaced and marked for shipment. The frames are 2 x 3 x 5/16 in. angles, spaced 18 in. with two Z-bar keelsons running from the peak bulkhead to the main transom. The main deck is of steel, part corrugated and the balance flat, all galvanized. The cabin deck is carried on angle iron stanchions riveted to the floors and main deck beam and made water tight at main deck by brass shoes 1½ in. high, calked to the deck and stanchions. The stringers and carlins are of channel bar and angle iron and the cabin deck is of wood, bolted to the beam and covered with 12-ounce canvas, which is thoroughly painted before erecting the cabin. The accommodations are fitted with large ventilators covered with brass screens and with screen doors for protection against tropical insects. Modern bath tubs and lavatories are fitted, supplied with water from tanks carried on cabin roof. Sleeping accommodations are provided for a few passengers, but considerable space fore and aft is allowed for hammocks, etc. The boat is designed to carry from 150 to 200 persons, including crew. The machinery is of the customary high pressure type, with lever-balanced valve, and the familiar "doctor" of the western river boats is also used. All water and exhaust pipes are of copper and brass. The boilers are three in number, of the cylindrical tubular type, externally fired, and are set in brick with iron casing. Bilge pumping arrangements are fitted to all compartments, and steam capstan is fitted forward for hoisting the stage and handling lines. All machinery is built in the Rees shop. The vessel is designed for a speed of about 15 miles per hour on 3 ft. draught with 225 tons of freight. The maximum load capacity is 550 tons. When launched her draught was 22 in. aft. and 12 in. forward. The cost of the vessel complete with outfit in South America is estimated at $70,000 gold.

The first steel hull steam boat in South America was erected by T. M. Rees, of the present Rees Co., in 1878. Since then the company has built a number of smaller craft, and now has about 25 boats of its construction running upon the Magdalena and Cauga rivers.

Raising Standard Oil Barge No. 91

BARGE No. 91 of the Standard Oil Co.'s Pacific coast fleet was raised and put back into commission after being seriously wrecked just inside the Columbia river bar early last May. The successful wrecking of the barge was the result of the energy and resourcefulness of the Standard Oil Co.'s officials and their perseverance in the face of difficulties.

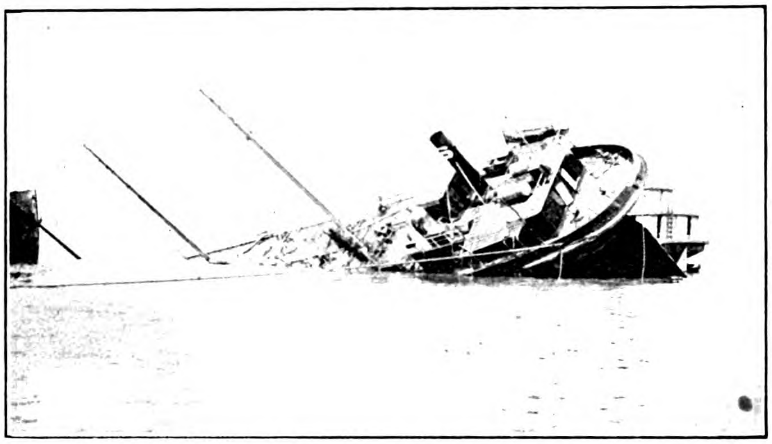


FIG. 1—BARGE NO. 91 ASHORE JUST INSIDE THE COLUMBIA RIVER BAR, MAY 14, 1909.

Credit for the work is due to J. C. Rohlfs, manager of the marine department of the Standard Oil Co., San Francisco, and to Capt. George Bunting and Robert L. Hague, the latter gentlemen having immediate charge of the work.

After wrecking operations had been commenced, the barge, being subject to strong currents and tides, turned on her beam ends and later sank out of sight. Steel tripods erected on the starboard side were particularly useful in righting her. The tripods were fabricated by the Willamette Iron & Steel Works under the direction of Capt. Bunting and Mr. Hague. The methods pursued were well suited to the occasion and a knowledge of the details of the work would be of great value to anyone facing a similar problem elsewhere.

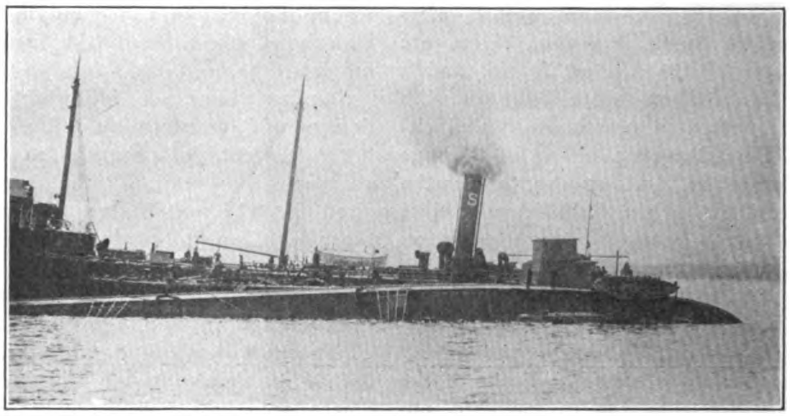


FIG. 3—BARGE NO. 91 CAPSIZED BY FLOOD TIDE AFTER WRECKING OPERATIONS HAD BEGUN.

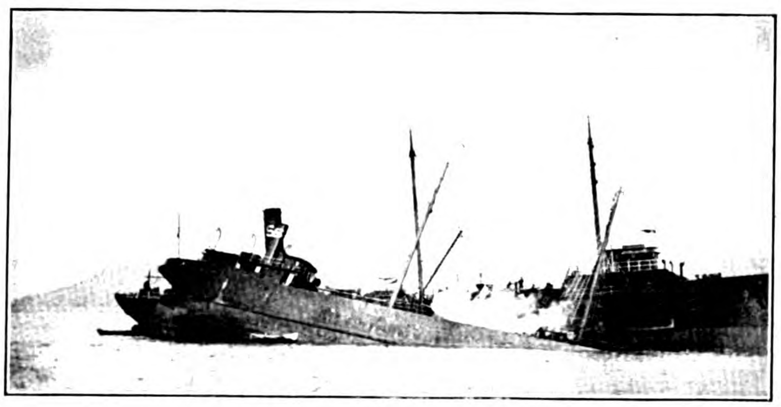


FIG. 2—STARBOARD SIDE BARGE NO. 91 IMMEDIATELY AFTER FOUNDERING.

Early in May the Standard Oil Co.'s tank steamer Maverick, loaded with refined oil, sailed from San Francisco to Portland, Ore. The Maverick had in tow steel oil barge No. 91 loaded with 22,000 barrels of fuel oil. The barge was built in 1900. It is 257 ft. in length, 42 ft. beam and 25 ft. in depth; its registered tonnage is 2,019 gross and 1,851 net.

The Maverick is a steel steamer 240 ft. in length, 36 ft. beam, 24 ft. deep, 1,561 gross tons and 1,118 net tons.

When crossing the Columbia river bar the barge struck heavily a number of times, breaking the forward seacock and fracturing a number of plates and rivets. The several severe shocks broke the main oil pipe line on the bulkhead between No. 1 tank and the pump room, flooding the pump room with oil. The steam pipes to the cargo pumps were also broken, rendering the barge's two big cargo pumps useless. The barge settled rapidly by the head and about five miles west of Astoria sunk to the bottom in the channel in about 40 ft. of water. The Columbia river freshets were on and the barge's bow settled into the shifting sand about 12 ft.

Wrecking operations were immediately begun, but no suitable appliances being available at Astoria or Portland considerable valuable time was lost before proper pumps and equipment could be brought from San Francisco. The Puget Sound Salvage Co., of Seattle, ordered its wrecking steamer, Santa Cruz, to the scene of operations, but she proved of little value as her centrifugal pumps could not lift the heavy fuel oil. The Standard Oil Co. then decided to take charge of the operations themselves, and J. C. Rohlfs, manager

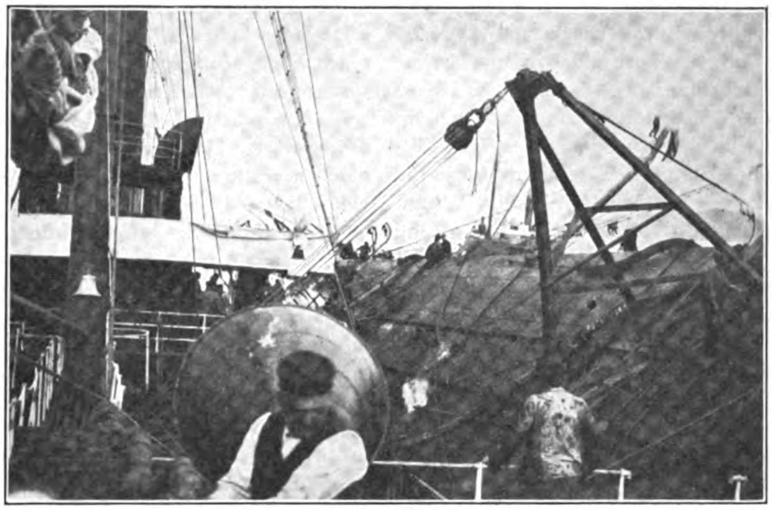


FIG. 5—STEEL TRIPODS ERECTED ON THE STARBOARD SIDE OF BARGE NO. 91 TO ASSIST IN PLACING HER ON AN EVEN KEEL.

of the marine department, placed Capt. George Bunting in charge of the wrecking, with Robt. L. Hague as engineer. Capt. J. Metcalfe, of San Francisco, was consulted from time to time.

Barge No. 91 was bottled up to prevent the oil escaping on the water. The main object was to avoid injury to the salmon industry; saving the barge was given secondary consideration. Powerful oil pumps were ordered from the Standard Oil refinery at San Francisco and installed on a barge together with an air compressor and miscellaneous tools. In the meantime, and while arrangements were being made to pump, the flood tide swung the barge around out of the bed she had made for herself and broadside to the swift ebb current which, with the aid of the freshets, finally capsized the barge as shown in Fig. 3. All arrangements had been made for pumping the oil out through the deck hatches but the capsizing made it necessary to begin all over again.

Six-in. holes were cut through the sides into the six oil compartments and 6-in. pipe inserted down to the fore and aft bulkhead, about 20 ft. The pipes were properly provided with valves and stuffing boxes. Tanks Nos, 1, 2 and 3 were under water but the holes were cut through and the pipes installed with the aid of cofferdams. Two-in. holes were drilled alongside the 6-in. openings and 2-in. vent pipes were installed. These pipes were also used to lead exhaust steam from the pumps into the tanks for heating the heavy fuel oil and to make pumping easier. A ½-in. air hole was also drilled into each of the oil tanks and air hose connected.

When all this work was finally completed the barge suddenly sank out of sight and bedded herself about 9 ft. in the sand. There was now 12 ft. of water over her at high tide and the wrecking barge floated over No. 91 with the current and broke all the connections. A pile driver was immediately secured and 15 piles were driven alongside No. 91 to hold the wrecking plant in position. A diver was sent down to put slings around the broken connections, which were then hoisted to the surface and re-connected to four large oil pumps. The steamer Asuncion, capacity 22,000 barrels of oil, one of the fleet of the Standard Oil Co., was placed alongside to receive the oil from No. 91 and to furnish steam for the pumping. Pumps were started and with the assistance of compressed air the oil came out of the barge at the rate of 3,000 barrels per hour. The barge immediately came to the surface again as shown in Fig. 4, and floated. After pumping for some time longer the barge was pulled in close to the beach against a sharp rising embankment, her masts resting on the embankment, which prevented her from turning turtle. No. 91 was then moored firmly to prevent shifting and steel tripods were erected on her side, as shown in Fig. 5. With the assistance of the tank

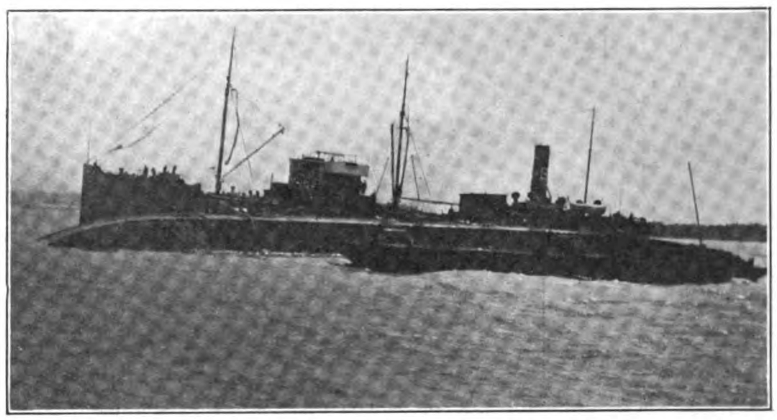


FIG. 4—BARGE FLOATED ON HER BEAM ENDS AFTER PUMPING OUT PART OF HER CARGO OF OIL.

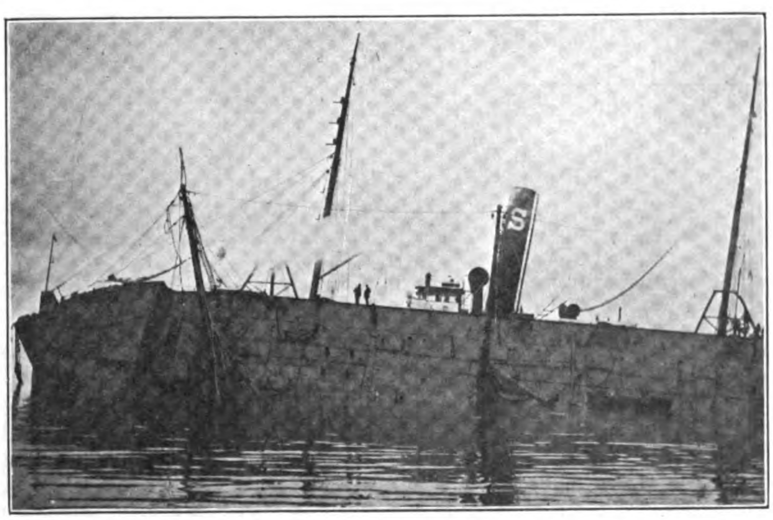


FIG. 6—BARGE NO. 91 PARTLY RIGHTED BY TACKLE FASTENED TO TRIPODS ERECTED ON HER STARBOARD SIDE, S. S. ATLAS STANDING BY.

steamship, Atlas, also belonging to the Standard Oil Co., the barge was partially righted and assumed the position shown in Fig. 6. Pumps were then lowered on the port side to pump out the water and by keeping a strain on the tripods the barge was finally righted.

The barge sunk on May 13 and was raised and placed alongside a wharf on June 21. Her cargo consisted of 22,000 barrels of oil, out of which 21,000 barrels were saved.

DETAILS OF STEEL TRIPODS AND PIPE CONNECTIONS USED IN RAISING STANDARD OIL BARGE NO. 91.

Through the courtesy of the Willamette Iron & Steel Works, Portland, Ore., we are able to present herewith detailed drawings of the steel tripods used in rasing Standard Oil Co. barge No. 91, which foundered near the Columbia river bar, May 13, 1909.

When the barge was brought to the surface she lay on her beam ends, starboard side up. In order to get a suitable purchase for the tackle used in righting the barge these tripods were erected on her side to carry the cables. A heavy chock (not shown in the drawing, Fig 1) was bolted to the top of the tripod. The cables were reeved through the chock and fastened solidly on the port side of the barge.

The tripods were designed to carry a load of 100 tons. As is shown in Fig. 1, the principal member is a 10-in. 35-lb. I-beam. This beam bore the majority of the thrust. A 12-in. I-beam 7 ft. long is riveted to the heel of the 10-in. member. This beam distributed the load over at least three frames and prevented the ship's side from buckling.

The amount of stress to which the tripod was liable to be subjected was rather indefinite as the conditions of righting could not be accurately foreseen. As a result one of the tripods was buckled by a load considerably in excess of 100 tons. It was estimated that the stress amounted to 200 tons before the structure gave way. After this partial failure, and in a bent condition, the tripod sustained considerable load.

Fig. 2 shows the pipe connections designed so they could be quickly fitted to the oil tanks by a diver while under water. The openings in the oil tanks which were to be pumped out were a considerable distance below the water line and were stopped with screwed plugs. It was necessary for the diver to unscrew these plugs and insert some kind of a connection in the hole. The connection had to be inserted and made tight quickly and it was not practical to fit a thread under water. The elbow and length of pipe necessary to reach the surface were screwed to the fitting in Fig. 2 and the whole was lowered into the water.

The fitting consists of a 6-in. pipe provided with two internal dogs held in place by a 16-in. flat spring. Openings in the pipe allow the dogs to project outside. The outer part of the connection and water tight joint was made by screwing a special notched brass nut 10½ in. in diameter down on a steel plate ring and a ⅛-in. rubber gasket, the nut being screwed down by a special spanner with a handle 4 ft. in length.

The diver unscrewed the plugs in the tanks and forced the plain end of the connection through the hole. The dogs, held out by the spring, collapsed sufficiently to slide through and were then forced out against the inner side of the tank plate. The outer nut was then screwed down. This connection can be quickly applied under water and proved very useful in wrecking the barge.

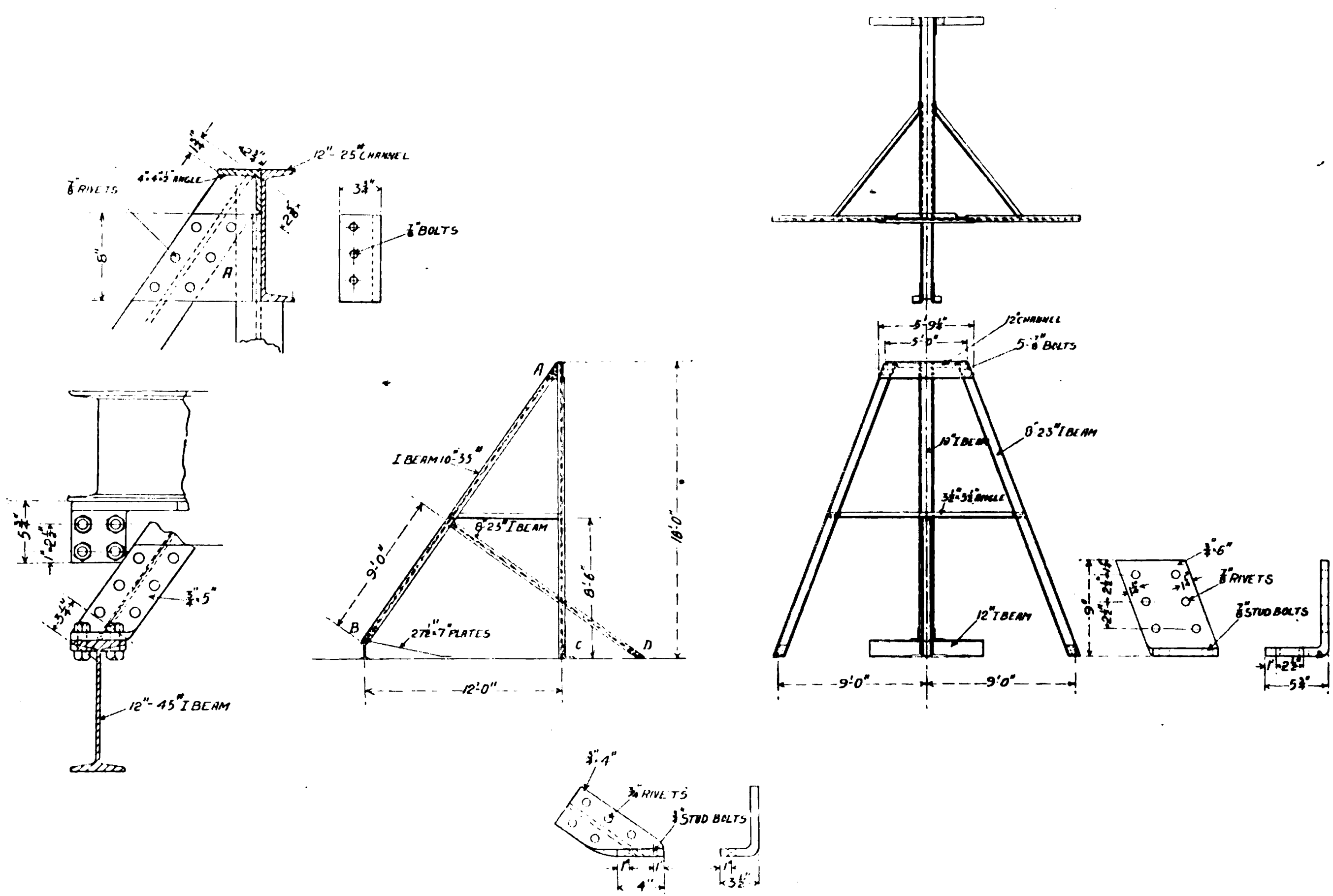


FIG. 1—DETAILS OF STEEL TRIPODS USED IN RIGHTING THE CAPSIZED BARGE.

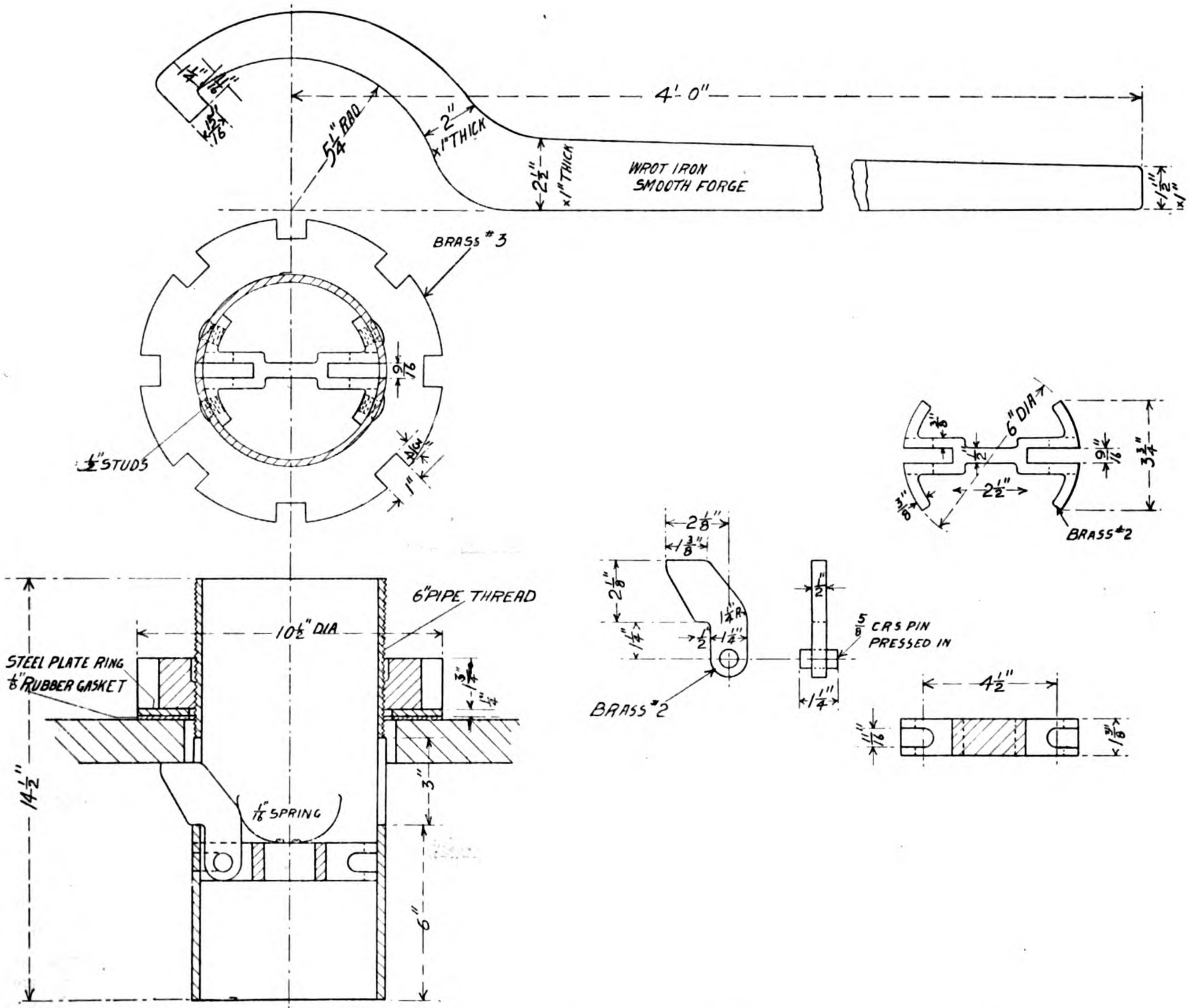


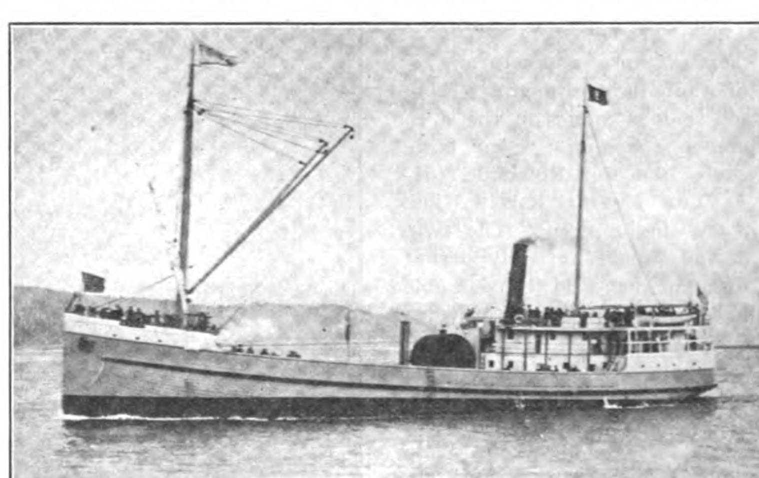
FIG. 2—DETAIL OF PIPE CONNECTIONS TO OIL TANKS OF BARGE NO. 91 FITTED UNDER WATER.

The tripods and pipe connections were designed by Bert C. Ball, chief engineer, Willamette Iron & Steel Works, in consultation with Robert L. Hague and Capt. George Bunting, of the Standard Oil Co.

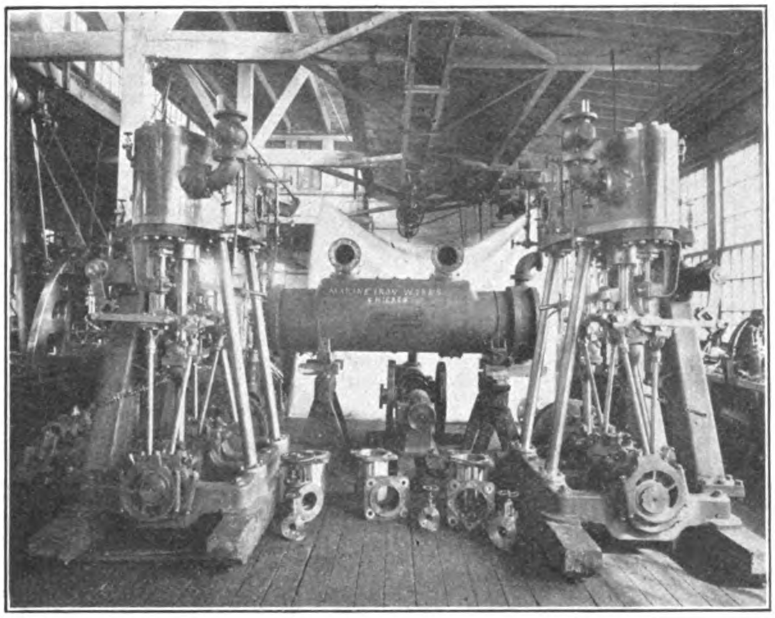
STEAMER FIFIELD.

The relative and growing scarcity of good timber close to deep water harbors on the Pacific coast has resulted in the establishment of a considerable number of export saw mills on shallow rivers or at the head of relatively shallow harbors. The Coquille river in Oregon is an example of this condition; a number of export saw mills are located at points inaccessible to vessels of over 10 ft. draught. This has resulted in the construction of a number of light draught, sea-going lumber schooners specially designed for this class of trade. The steamer Fifield, built last year by the Kruse & Banks Ship Building Co. at North Bend, Oregon, is an excellent example of this type of vessel. As time goes on and the quantity of good lumber near deep water grows still less, the number of these light draught vessels will increase. For this reason they represent a type that is relatively more important than their numbers would indicate.

The Fifield is built of wood, the timber being clear Oregon fir with hardwood trimmings. The model of the hull is fairly fine. The entrance



PACIFIC COAST LUMBER STEAMER FIFIELD.



MAIN ENGINES OF STEAMER FIFIELD.

lines are unusually good. The bilges are rather flat. The stern is the seaworthy, standard fan tail type that has proven entirely satisfactory for moderate speeds. The hull is 180 ft. in length over all, 40 ft. extreme beam and 12 ft. in depth. The vessel registers about 600 gross tons. The hull has a solid, water-tight bulkhead in the center.

Although designed primarily as a cargo vessel, the Fifield has accommodations for 30 first class passengers. The cabins are all located aft, leaving the main deck amidships clear for cargo. The cargo is handled by two swinging derricks on the foremast. The vessel has a speed of 10 knots an hour. On a 10-ft. draught she has a lumber capacity of 500,000 ft.; on a 13-ft. draught this capacity is increased to 600,000 ft.

The main engines, boilers and most of the auxiliaries were designed and built by the Marine Iron Works of Chicago.

Twin screws were adopted on account of the light draught. Twin screws are seldom found on the deep water lumber schooners; even large steel vessels like the Riverside (described in THE MARINE REVIEW, Jan. 7, 1909), are single screw. The twin screws of the Fifield not only permit a light draught but add considerable to her handiness in navigating crowded channels.

The main engines are fore-and-aft compound, having high pressure cylinders 12 in. in diameter fitted with balanced piston valves and low pressure cylinders 25 in. in diameter fitted with double ported slide valves. The common stroke of all the cylinders is 16 in. The engines have standard Stephenson link motion reverse gear with double bar links. The cross heads are steel. There is an independent, adjustable cut-off for each cylinder. The indicated horsepower of the two engines is 600. The engines are coupled to right and left hand 4-blade propellers, each 7 ft. in diameter.

The condensing apparatus consists of an independent, inboard surface condenser manufactured by the C. H. Wheeler Co. The condenser has 900 sq. ft. of cooling surface. There is a 5-inch, independent, centrifugal side-suction circulating pump coupled to a 4½ by 5-in. steam engine and a brass fitted, double acting vacuum pump.

Steam is supplied by two Scotch marine boilers. Each boiler is 7 ft. in diameter by 10 ft. in length and has 162 2½-in. tubes. The boilers have a total heating surface of 1,900 sq. ft. and carry a steam pressure of 160 lbs. per sq. in. Crude oil is used for fuel.

The boiler feed is handled by two bronze fitted feed pumps each 5¼ x 3½ x 5 inch. There is also a hand test pump for 600 lbs. pressure and an auto-positive injector.

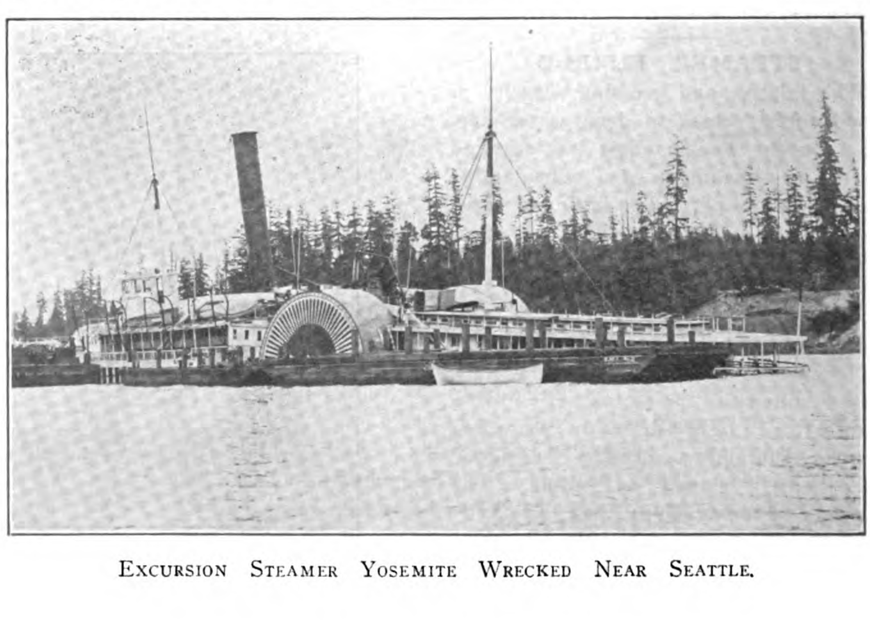
The auxiliaries include a donkey boiler, steam capstan and steam anchor winch. The donkey boiler is 48 in. in diameter, 75 in. high, flush tube design, and carries 125 lbs. steam pressure. The steam capstan is of the enclosed base type with double 5 x 8-in. engines. The anchor winch is of standard design with double 7 x 8-in. engines.

The Fifield was equipped ready for sea at Kruse and Banks' ship yard. Her trial trip was made July 15, 1908.

The former great lakes steamer Minnie E. Kelton which was sold to the Pacific coast some time ago and wrecked on her first trip, has been raised from her position on the Columbia river bar by Daniel Kern, of Portland. She was put in dry dock at Portland, and her machinery removed.

WRECK OF THE STEAMER YOSEMITE.

The Puget Sound excursion steamer Yosemite was totally wrecked in the narrowest part of Rich's passage, the entrance to Port Orchard bay, by striking a reef at 5:45 p. m., July 10. The weather was perfectly calm and none of the several hundred passengers on board were injured. The reef on which the Yosemite struck is very close to shore, scarcely more than 250 feet, and lies parallel with the channel. The steamer lies now with her stern hanging over in deep water and her back broken.



EXCURSION STEAMER YOSEMITE WRECKED NEAR SEATTLE.

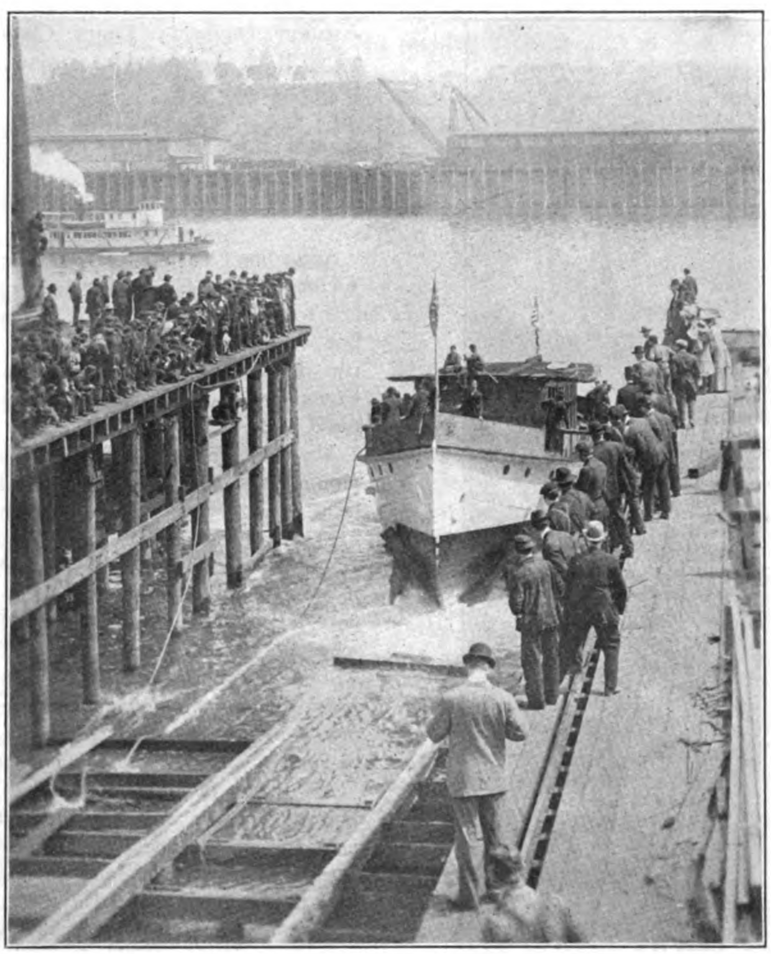
A strong tide makes through the narrows. The Yosemite was notoriously hard to steer and was at the time of the accident undoubtedly proceeding too close to shore. It is claimed by Capt. Edwards, who, with two quartermasters, was in the pilot house at the time of grounding, that the big side-wheeler was caught in a severe tide rip, took a sudden sheer to starboard and could not be straightened on her course before she struck.

The Yosemite was a side-wheel steamer, equipped with the old-fashioned walking beam. She was built in 1862; was 269 ft. in length by 35 ft. beam, and registered 1,319 tons. At one time she flew the British flag under the ownership of the Canadian Pacific railway, which operated her as a passenger steamer between Victoria and Vancouver. She has had a checkered career and was built at San Francisco for service on the Sacramento river. For the past year she has been operated as an excursion steamer on Puget Sound by C. D. Hillman, a real estate operator.

Persons who have examined the hull state that it will not pay to raise and repair the vessel.

Steel Artillery Tenders Built on the Pacific Coast

TWO steel artillery tenders for the United States government, quartermaster's department, have been recently completed at the ship yard of the Willamette Iron & Steel Works, Portland, Ore. The boats are exact duplicates and are to be used as tenders to the various forts defending the Pacific coast. In appearance and design these two vessels are very much like well built steel tugs, with the exception that the cabin accommodations are a little more commodious than those found on the ordinary commercial tug. The pilot house and texas containing accommodations for the navigating officers, are mounted on the hurricane deck, while the main cabins are built directly on the main deck which is left open forward for carrying bulky cargo. Aft on the main deck are heavy towing bitts substantially built into the framing of the hull.



LAUNCHING OF THE ARTILLERY TENDER, CAPT. JAMES FORNANCE.

The vessels are constructed of steel throughout. The hulls are 98 ft. in length, 22 ft. beam and 14 ft. in depth. The engines are tandem compound with high pressure cylinders 13 in. in diameter, low pressure cylinders 26 in. in diameter and a common stroke of 18 in.

Steam is generated in one Scotch marine boiler 10 ft., 6 in. in diameter, carrying a working pressure of 150 pounds per square inch. The furnaces are arranged to burn coal.

The boats have a designed speed of 10½ miles per hour. Each boat is fitted with special, extra heavy davits for planting submarine mines.

The photographs show the hull of one of the vessels, the Capt. James Fornance, while under construction and again while being launched. The line drawing indicates the general arrangement of the vessels.

Twelve of these boats were built, ten for the Atlantic coast and two for the Pacific coast.

PLIMSOLL MARK FOR AMERICAN VESSELS.

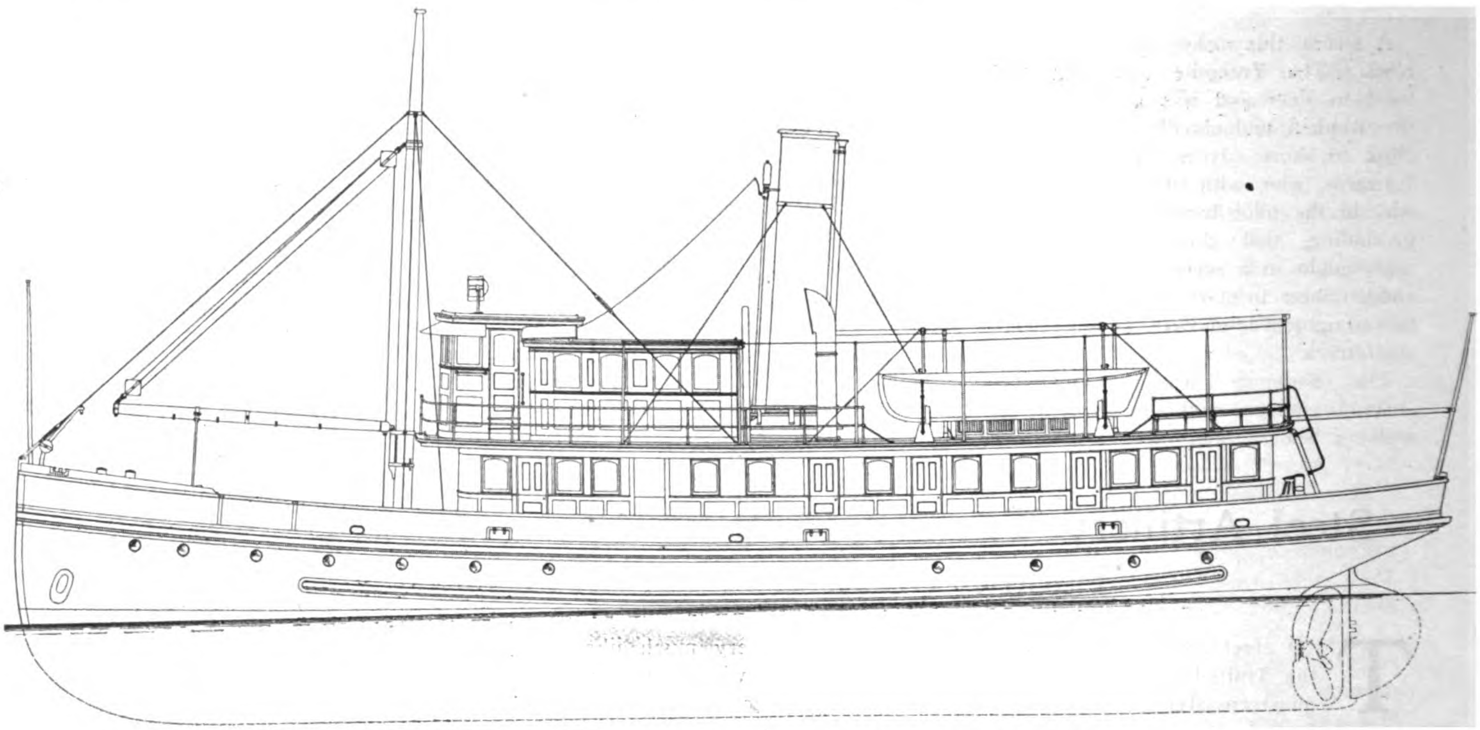
Official notice has been given that United States vessels trading in ports of the United Kingdom must be marked with the load line according to British regulations after Oct. 1 next.

TUG GRAYLING PROBABLY LOST.

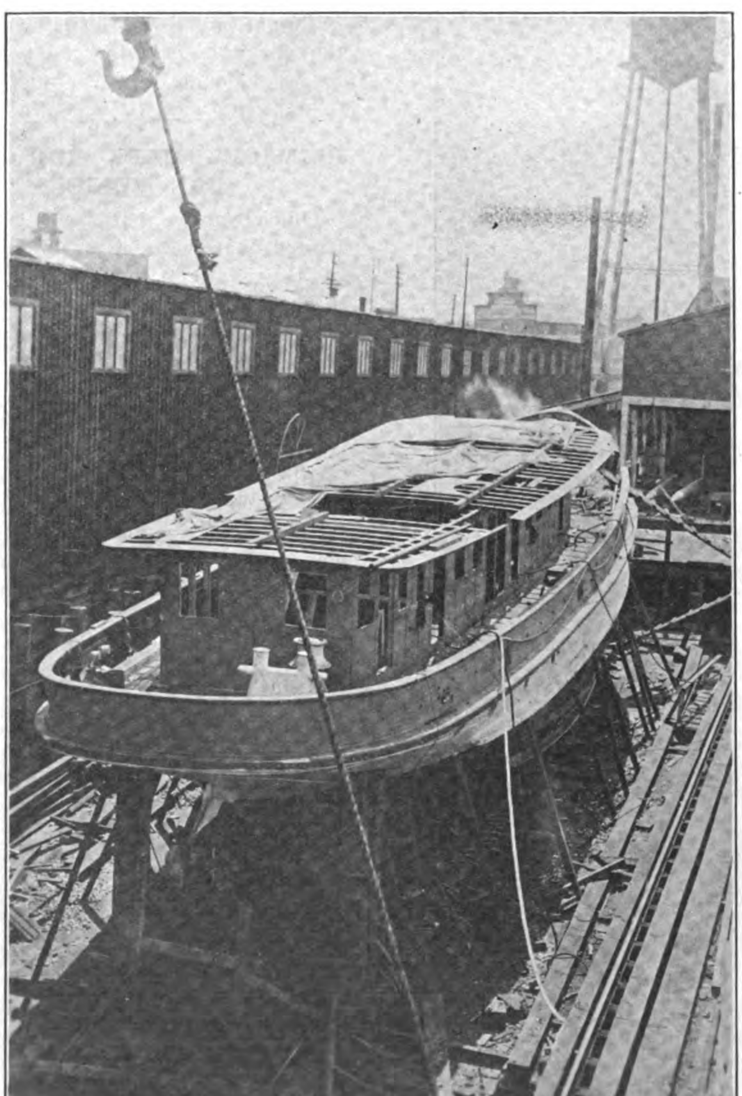
All hope for the safety of the little tug Grayling which essayed to make the voyage from Puget Sound to Panama has been abandoned. The Grayling is a small tug 58.5 ft. in length and 13.8 ft. beam, registering 28 tons gross and 19 net. She left Seattle for Panama May 27, and has not been reported since she spoke the steamship Mexican south of Cape Blanco early in June. She had provisions for 45 days and 35 tons of coal; at the date of this writing she has been out 61 days. She should have made port in 25 days.

The Grayling was boarded up fore and aft and made as seaworthy as possible by John B. Mitchell, Seattle. An illustrated article describing the work done in preparing the Grayling for the sea was published in the June issue of THE MARINE REVIEW, page 152.

The little tug was in command of Capt. A. A. Moore. The crew consisted of Charles W. Tuttle, mate; Peter McQuade, chief engineer; C. H. Shubbe,



PROFILE PLAN OF ARTILLERY TENDER, JAMES FORNANCE.



ARTILLERY TENDER, CAPT. JAMES FORNANCE, UNDER CONSTRUCTION AT THE YARDS OF THE WILLAMETTE IRON & STEEL WORKS.

assistant engineer; James Clark, fireman; R. J. Lewis, able seaman; E. R. Welsh, cook.

It is feared that the little vessel shipped a big wave and foundered.

NEW CHINESE STEAMSHIP LINE.

According to advices coming from Victoria, B. C., several steamships are to be built at German yards for a line of Chinese steamers which are to run between Oriental ports and San Francisco, and also between points on the China coast.

The Chinese board of posts and communications has proposed to float a large shipping company with an enormous capital to inaugurate this service. In addition to the lines to America it is planned to run steamers to Singapore, Java, Australia and Bombay whenever it is decided that such lines will pay. The capital is to be contributed by the government and the merchants equally and the concern will be under their joint management.

An order is to be given to a well known German firm for ten steamers now and more vessels to be built in the future. Owing to the difficulty in raising the necessary funds, the imperial government has not yet decided whether to accept the proposal of the board of posts and communications or not.

Another phase in the development of Chinese shipping is the entry into the trade of the Yangtze. A Chinese company has been formed known as the Suchuan Steam Navigation Co. to run merchant steamers on the Yangtze-Kiang between Ichang and Chungking.

New Method of Steel Hull Construction

STEEL vessels as generally designed and built for carrying lumber or other bulky cargoes have two principal disadvantages; longitudinal weakness, exhibiting in the extreme a tendency to break in two, and lack of sufficient ballast capacity to make trips through stormy seas in safety when running without cargo or with high deck loads. If sufficient ballast is provided to make the vessel stable when light, then the double bottoms are so deep that with a full load the center of gravity of the ship is too high, almost as high as the metacenter, making a very tender vessel. An extreme case of these conditions is found in the lumber trade of the Pacific coast where the vessels are loaded southbound and light northbound, at both times being subject to heavy coastal seas. Many attempts have been made to evolve a design of ship for this trade or for similar conditions met elsewhere which would be equally satisfactory at all times whether loaded or light and regardless of weather conditions. To solve this problem effectually is unusually difficult. Ships have been proposed and some have been built with ballast tanks arranged under the decks or on the sides. We present herewith drawings showing a new system of construction designed by Edward C. Hough, San Francisco, which is claimed to obviate the objections to the usual systems of ballasting.

The feature of the design is a central trunk or longitudinal double bulkhead extending from the fore peak to the engine room, so built as to stiffen the hull longitudinally, in the direction in which it is weakest, and also to provide high and low tanks for fuel oil which can be also used as ballast.

A vessel has been designed embodying these principles, the plans and cross sections of which are shown herewith. The vessel is 295 ft. 6 in. in length over all, 276 ft. in length between perpendiculars, 48 ft. molded beam and 21 ft. molded depth.

This steamer has the usual equipment of a steam schooner: a 1,600 H. P. triple expansion engine and two Scotch marine boilers, each 15 ft. in diameter and 11 ft. 6 in. long; a submerged tube donkey boiler 7 ft. in diameter and 11 ft. long; a towing machine; six sets of cargo gear and six cargo winches.

The central trunk, referred to above, is simply a double longitudinal bulkhead which divides the hull into two complete holds. The space between these bulkheads, which are not usually over 4 ft. apart, is utilized for fuel oil tanks.

Each of the two holds are 21 ft. 6 in. wide in the clear, 180 ft. in length and 16 ft. deep. Each hold is served by three hatches, the hatches being 15 ft. 3 in. wide and 40 ft. long. The under deck lumber capacity of the vessel is approximately 1,500,000 ft. board measure.

The central trunk is 3 ft. 6 in. wide and extends from the floor to the main deck in the design shown with this article. It is built of 12.5 lb. plates and 3½ x 3½ and 5 x 5-in. angles. This trunk contains six fuel tanks, three high tanks and three low tanks. The capacities of the tanks are approximately as follows, taking the weight of fuel oil at 59 lb. per cu. ft.:

High tank No. 1	2,670 cu. ft. or	78.6 tons
High tank No. 2	2,170 cu. ft. or	64.0 tons
High tank No. 3	2,415 cu. ft. or	71.2 tons
Low tank No. 1	2,290 cu. ft. or	67.5 tons
Low tank No. 2	2,220 cu. ft. or	65.5 tons
Low tank No. 3	2,475 cu. ft. or	73.0 tons
Total tons ballast in central trunk		419.8 tons

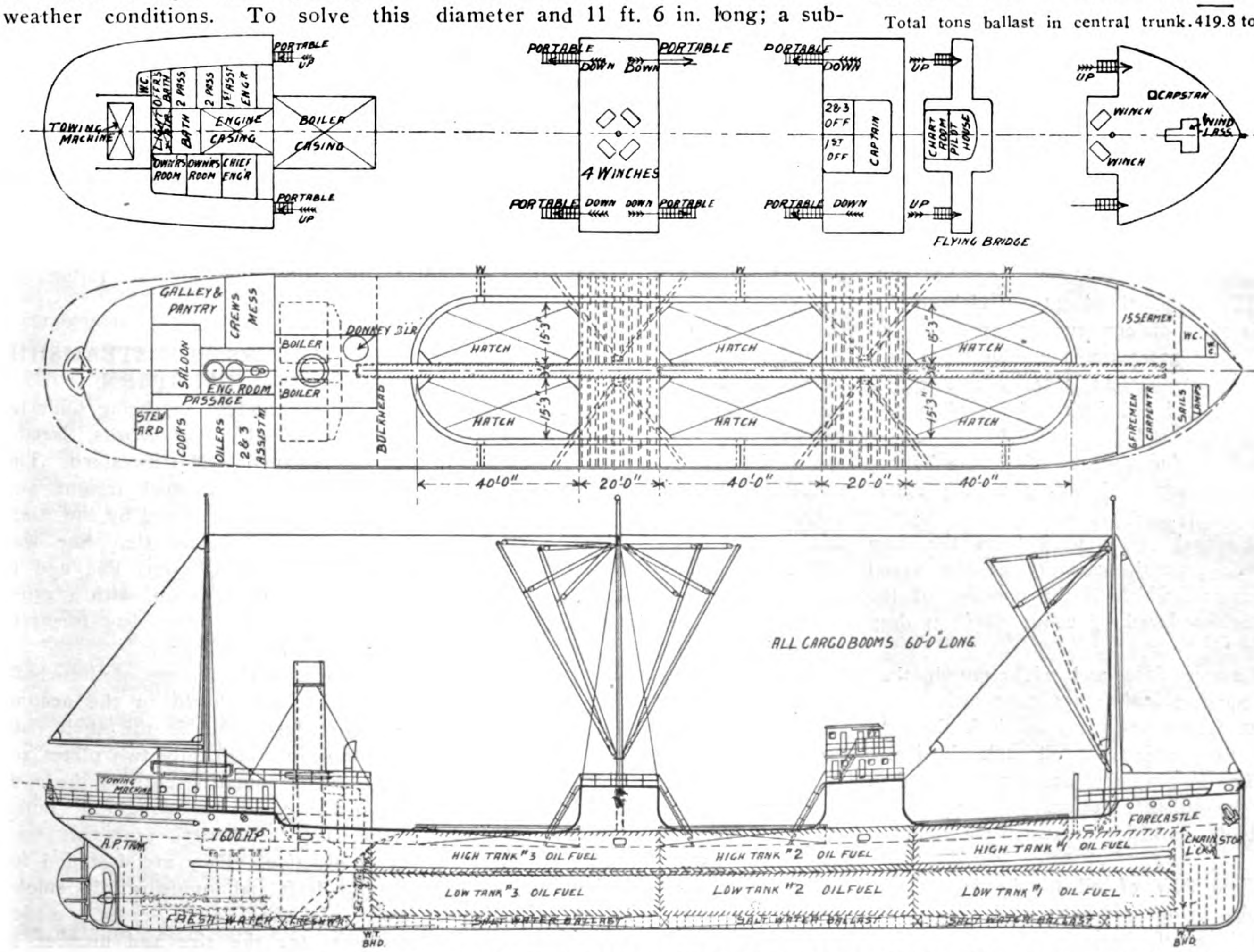


FIG. 1—PLANS OF LUMBER SCHOONER FITTED WITH CENTRAL TRUNK DESIGNED BY EDWARD S. HOUGH, SAN FRANCISCO.

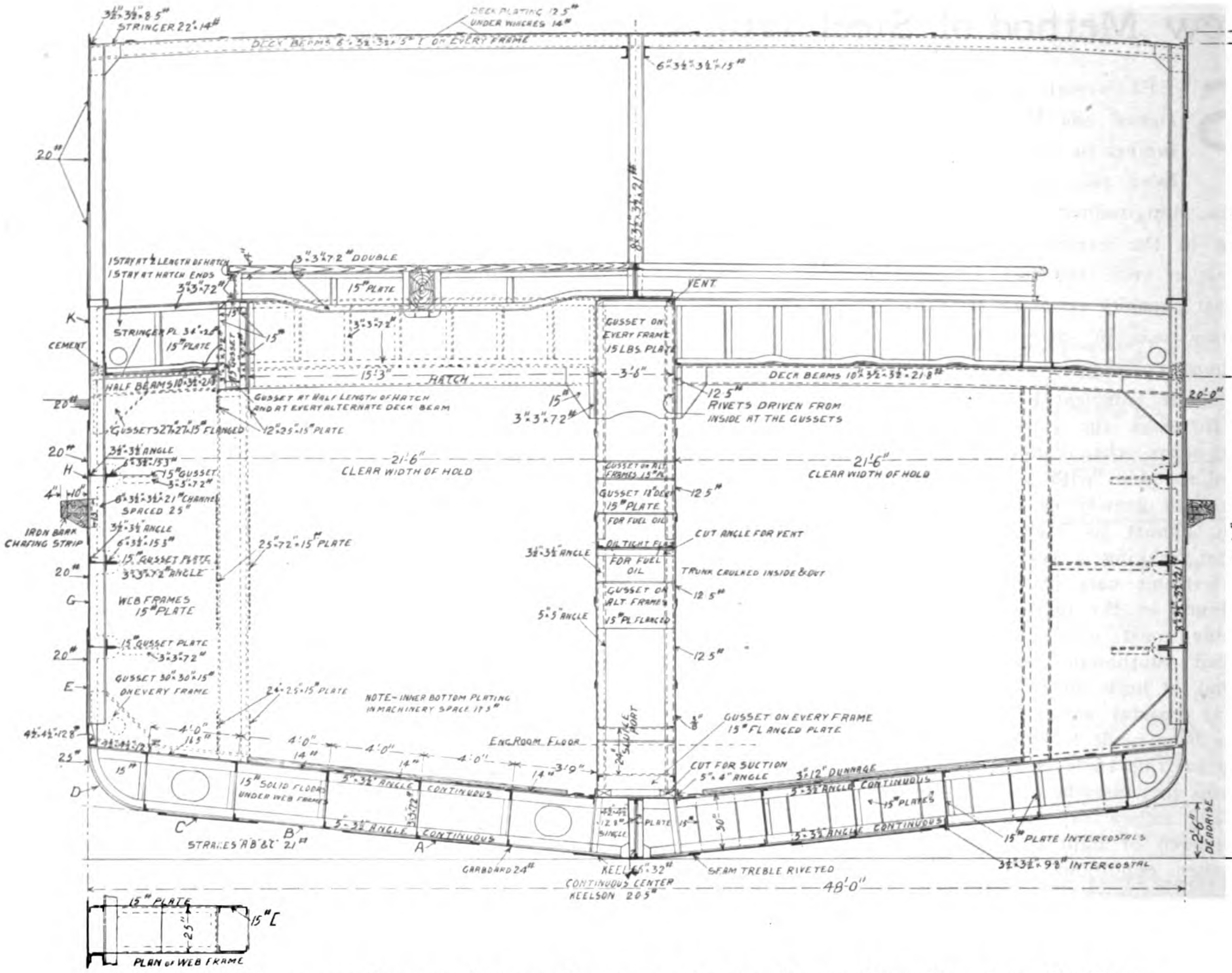


FIG. 2—CROSS SECTION OF STEAMER SHOWING DETAILS OF CENTRAL TRUNK WITH DEEP FUEL OIL TANKS.

The double bottom is only 30 in. deep. It is 54 in. deep on the ordinary steel lumber schooners of the Pacific coast.

The principal advantages claimed for this type of construction are:

Lower gross tonnage than other vessels of equivalent capacity and consequently reduced dock and wharf dues.

Greater stability when loaded owing to the reduced depth of double bottom and consequent lowering of the center of gravity.

As fuel oil is used from the deep trunk tank the stability of the vessel increases, which is the opposite of the effect produced by using oil from deep double bottoms.

Greater fore and aft strength than is possible with other construction.

It is not necessary to dock the vessel to examine the oil tank riveting.

The hull weights are not greater than in the ordinary design.

Hold stanchions are entirely eliminated.

Free flow of oil to the pumps, the tanks being under a head. Also the oil is at the temperature of the hold, which in winter is higher than that of the sea.

Fuel oil cannot be lost overboard and oil cannot leak into the sea should the vessel strike bottom and have her outer skin punctured.

This plan of construction also allows correct ballasting, the high tanks being used when the vessel is light or carrying low cargo; the low oil tanks are used when high deck loads are carried.

Equal cargo space below decks to vessels having deep double bottoms.

The surfaces of the oil tanks are not exposed to the weight of the cargo.

The design is particularly applicable to vessels carrying freight where great breadth of beam is necessary and the draught is limited it is also specially adapted to lumber and similar cargoes requiring unusually large hatches for economical loading and discharging.

Means are provided whereby the fuel oil or water ballast can be distributed in the various subdivisions of the trunk tank. Sluice gates are installed, worked from convenient positions, which provide communication between the holds. Water ballast is carried in the double bottom as usual.

The design has been accepted and classed with the highest rating by Bureau Veritas.

NEW BOILERS FOR STEAMSHIP NORTHWESTERN.

Four new boilers are being built by the Commercial Boiler Works, Seattle, for the Steamship Northwestern. The Northwestern is a steel freight and passenger steamer, owned by the Alaska Steamship Co., Seattle. She was built in 1889 at Chester, Pa., and is 336 ft. long, 43 ft. beam, with a gross tonnage of 3,497. She was formerly known as the Orizaba.

The noteworthy feature of these boilers, which are shown in the accompanying illustration, is the shell construction, in which only two plates are used, thus eliminating entirely the middle girth seam and staggered butts. Otherwise the boilers represent very usual practice. They are designed for natural draft and for using the smoky coal of the Pacific coast, which accounts for the size and number of

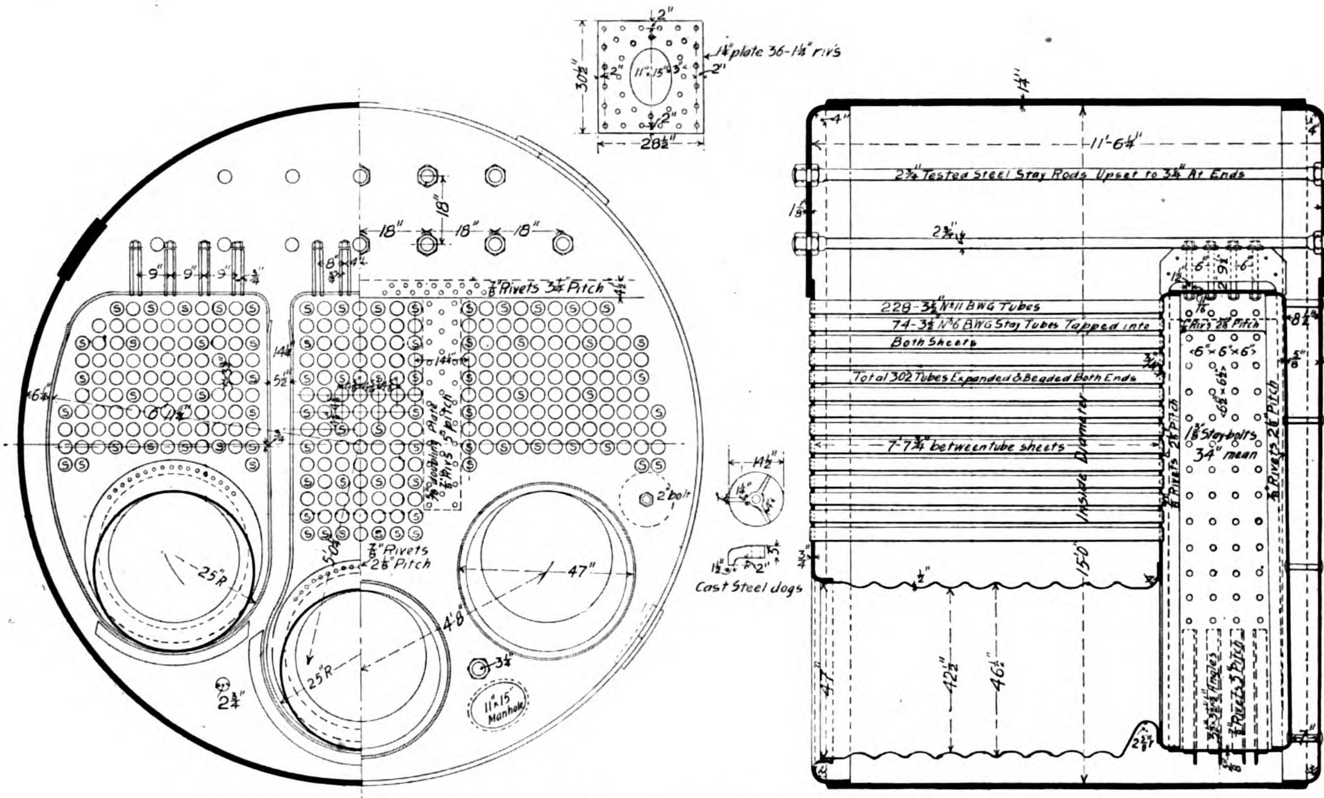


FIG. 1—LONGITUDINAL SECTION AND ELEVATION OF BOILERS FOR STEAMSHIP NORTHWESTERN.

tubes employed. The boilers will be placed facing each other athwartship, with the fire hold fore and aft between them. The grates are 6 ft. long, giving a total of 63 sq. ft. for each boiler. The working steam pressure is 160 lbs. The bunkers extend athwartship forward of the boiler room and ample facilities are provided for trimming coal to fire-hold floor.

POWER BOAT BAINBRIDGE.

One of the most interesting examples of the invasion of the power boat into commercial fields formerly sacred to the steam engine alone is found in the power passenger boat Bainbridge which is now making regular trips between Seattle and points on Bainbridge Island. The Bainbridge is a strictly passenger vessel and is operated in competition with a line of regular steamers. She is making good and S. S. Monks of Seattle, one of her owners, is well pleased with her performance.

Power is supplied by a 75-H. P. Troyer-Fox gasoline engine built by the Astoria Iron Works, Astoria, Ore. The engine has four cylinders each 9½ in. in diameter by 11½-in. stroke. The engine develops its full power at 300 R. P. M. It is coupled to a three-blade bronze propeller, 44 in. in diameter by 58-in. pitch. The speed of the Bainbridge is 14 miles per hour. The engine burns distillate which can be obtained in Seattle for 9 cents per gallon.

The hull of the Bainbridge was built in 1908. It registers 39 gross tons and 26 net tons. The vessel is 79 ft. in length, 12 ft. 6 in. beam and 4 ft. 6 in. in depth. She carries a crew of two men.

The economy of the Bainbridge lies in her small crew, the low cost of distillate and her low lay-over charges. The fuel consumption of the Bainbridge is about 6 gallons of distillate per hour.

ENGINE ROOM OF THE BAINBRIDGE, SHOWING THE INSTALLATION OF THE 75-H. P. TROGER-FOX GASOLINE ENGINE.

THE NAVAL WASTE

Editor's Note:—We present herewith the first of the series of articles on the naval administration referred to in the July REVIEW. It should be kept in mind that these were written early in 1908 from notes made long before the Reuterdahl criticisms appeared. The author will later add notes bringing the subject down to date. The MARINE REVIEW did not join in the attacks on the navy and would not now but for the attitude of the department towards the Merchant Marine and the difficulty of securing relief at the hands of congress while naval appropriations go through apparently without investigation and in continually increasing amounts. We conceive, therefore, that it is only proper that the application of these funds should be shown. The author is well known in ship building and engineering circles, and is now and has been for years prominently identified with the industry. He is a member of several of the leading technical societies and is familiar with the various navy yards and their administration, and with the different private yards doing both naval and commercial work; has had a number of years sea service, and is well known to numbers of naval officers and department attaches, and writes, therefore, from knowledge and observation, and not from hearsay and belief.

IN JANUARY last there happened together in the rooms of a leading engineering society in an eastern city a small party of men actively associated with ship building and engineering industries. Among them were men whose names are known from one end of the country to the other. The conversation turned upon the just published criticisms of warship construction. Said one of the party, one of the best known and most capable naval architects of our day, who is known by reputation, at least, wherever ships are built in America and less widely perhaps, but still extensively, abroad: "The worst of it is, that it's nearly all true."

But this is *not* the worst of it. The worst perhaps as regards the navy's fighting efficiency, but not by any means the whole. The worst of it is that but a fragment of the truth has been told. The author has no intention of commenting on the subject of warship construction except to add that an additional 3 ft. of width of 8-in. armor for 200 ft. each side only weighs about 280 tons; less than the weight of one of the just now popular 12-in. guns with its mountings and equipment. In fact it would not be difficult to save a great part of that weight in superfluous accommodations and fittings, but the greatest saving would be by the jettisoning of at least a part of the red tape, dignity and misinformation, with which our ships and bureaus are top-heavy.

Neither are the rejoinders "unpatriotic" and "muckraking" from Washington justifiable or in any sense an answer. The people of the United States have poured their millions like water into the navy sponge. The navy's estimates and requests for more money have been patriotically responded to and no questions asked. Every man who earns or spends a dollar under the flag is a contributor and is entitled to question or criticize its expenditure so long as he does so intelligently, and he is entitled to an answer and a civil one, and not a snarling general statement that "the navy is the equal of any," coupled with slurring epithets from the bureaucrats at Washington who receive not only their education, but their subsistence as well, out of the public funds.

As a people we are not even satisfied to have our navy "the equal of any;" the national characteristic of being in the lead and the money voted and spent for it justify its being the superior of any, having regard of course for size. The "report" of Admiral Converse would better have been suppressed; so far from strengthening the cause of the navy it is merely a further array of general statements save in the comparison he makes with Russian ships. Are we then reduced to the necessity of turning to Russia to find something worse than our own? Even its worst enemies could not have said anything more contemptuous of our navy than that. The statements as to armor and turrets and ammunition hoists were definite and have not been controverted. As a matter of fact, announcement was made at Washington on Feb. 6 that the department had prepared plans for remodeling the turrets and ammunition hoists of the battleships of the entire fleet. Evidently the shot went home.

Seven Million for Four Colliers.

What the remodeling consists of we have yet to learn. On the same date reference was made to the department's request for $7,000,000 to build four colliers. *Seven million dollars for four colliers!* An average of $1,750,000 each. The cargo capacity of these proposed colliers was not stated in the report referred to. The navy has now under construction two colliers under an act approved April 27, 1904, at an estimated cost of $1,550,000 each. Their cargo capacity is given in the Report of the Bureau of Construction and Repair at 6,410 tons and their corresponding displacement at 12,500 tons. Do the people of the United States realize what this means? That to get a ship, *not a fighting ship*, but a common everyday coal carrier, they will pay what the navy, if it were not for its fool specifications and still more foolish methods and ideas, could buy three *better* ships for. They were authorized in April, 1904, the Report gives their estimated date of completion as July, 1909.

Five years to build a 6,000-ton collier. Probably twice as long. The one building in the navy yard at Mare Island is stated in the last bureau report to be 2 per cent completed. *After four years.* In this same country of ours there are builders who have, and do, put into commission, not a 6,000-ton *but a 10,000-ton*, coal ship, in *70 days* from the day the keel is laid and at *less than one-fourth* the cost. But the naval apologist will say that they are not so fast and they are not so good, and they are not armed, and they don't have to carry so many men and "anyway we couldn't use them." Right you are, Mr. Apologist. *They* are built for business and for people who do know how to use them and care for them enough and no more, and by people who *do know* how to build them, and they will be in service, *working*, not lying around navy yards, long after your brass trimmed toy has become "obsolete," the handiest term that was ever coined for your use.

Useless Cost of High Speed.

What does a collier want with 16 knots speed? She can't keep up with a battleship or cruiser; she is too fast for cruising speeds; she cannot carry anything at profitable, to say nothing of reasonable cost, as the merest amateur in shipping knows; she is altogether a useless, senseless waste of money. To illustrate: A perfectly supposable case is that we want to get coal to a fleet in the Straits of Magellan, where our ships coaled on the recently begun Pacific cruise, a distance of about 8,000 knots from Hampton Roads, as quickly as possible. That means, supposedly, that the colliers first referred to would be driven there as fast as possible, or at 16 knots. Their bunker capacity is stated to be 1,958 tons, or, with the cargo, a total on board of 7,958 tons. At 7,500 horsepower the coal consumption per horsepower per hour for all purposes will be approximately two

pounds, or 15,000 pounds per hour; the hours run would be 500 and the total coal 3,750 tons. Assuming that 2,000 tons are retained for the homeward voyage at reduced speed and, with all our outlay, we will have delivered to our fleet *2,000 tons*, just about enough to fill the bunkers of one of our new battleships. The naval apologist will object that no ship would be driven throughout the voyage at any such rate. Granted; but why then was their carrying capacity sacrificed and high power provided and cost increased for no purpose?

Perhaps the average citizen may suppose that in time of peace these colliers will be utilized in carrying coal to our various coaling stations. Perhaps he thinks those we have are so employed. Not a bit of it, for more than one reason. The cost of operating even a coal ship in the navy is many times greater than the cost of chartering tramps or coasters. They must be commanded by naval officers and simply carrying coal is something that naval pride cannot stand for; just ask one of them.

The interest on this $10,000,000 for the years the navy will be building its ships, if it was handed over as a present to some one who knows his business, would produce, long before the government ships are ready, five 9,000-ton, 12-knot colliers, which would carry more coal in two years than the navy-built and operated ships will do in all the years they are in existence, and even with charter in addition to the cost the country would be saving money.

Folly of Arming Colliers.

These colliers are armed with four 3-in. rapid fire guns, or will be some day. What for? Presumably to keep off other colliers, or bloody pirates maybe. Surely not for anything else. Our limited opportunities during the war with Spain demonstrated that even the common brand of torpedo boat could not be stopped by them. As to carrying men it has to be admitted that they do carry a good many. The complement is stated in the report to be 19 officers and 213 men. The ordinary cargo ship of that capacity at sea would carry about 40, all told. No wonder we can't get men for our navy. What is a crew of 232 going to do on a 6,000-ton collier. Fight? Rubbish.

And 12,500 tons displacement for 6,000 tons of cargo, a weight for the ship of over 6,000 tons or 50 per cent. No wonder the navy is a stench and a by-word among all who know anything, even rudimentary, about ship building. Five years, and $1,550,000 and 232 men and 16 knots and 7,500 horsepower and 12,000 tons displacement for 6,000 tons of coal. When the Pacific cruise of the navy was projected we had to scour the shipping offices to find colliers to carry coal for the fleet and not one American ship among them. Not even a collier belonging to the navy, and yet the navy list comprises 16 colliers already built. Where were they? Why didn't the navy use the colliers we provided the money for? Read the bureau reports. Laid up at navy yards; repairs; "special service," etc., and we are now asked to furnish $10,100,000 more that the navy may have six more to lay alongside of them.

Extravagance and Incompetence.

This is only one item of the torrent of extravagance and incompetence which, to any one familiar with ship building and shipping is apparent at every turn. Men whose sole knowledge of construction is technical, and wholly without practical knowledge or discretion, are detailed on supervision of work where they accomplish nothing but the hampering of progress and multiplication of expense. I do not believe there is a ship yard manager in the country who will not confirm this statement. As long ago as 1902, in a paper presented to the Society of Naval Architects and Marine Engineers, Geo. W. Dickie, manager of the Union Iron Works of San Francisco, the man who *did* build the Oregon but who has never been given credit for it, called attention to some of the features of department methods and all he succeeded in developing was a series of general statements holding out hope of improvement in the future. The conditions are no better today, worse if anything. An instance of the acquaintance of some of the constructors with practical ship work is to be found in a paper presented to the same society last November by one of the department's staff on "Two Instances of Unusual Repairs to Vessels." As a matter of fact there is probably not a dry dock anywhere that does not, in its ordinary business, meet with and handle repair jobs many times more "unusual" than those noted. The society was kind enough not to take too much notice of the exhibition. The story told by the manager of one of the largest and oldest forges in the country and familiar in most ship building and engineering offices, is also in point. The names are suppressed for obvious reasons. The concern in question had the order for the finished crankshafts of a certain naval ship building on the Pacific coast. In accordance with the custom of the department an inspector of machinery, detailed for the purpose, inspected and passed the shafts and they were shipped to their destination, but upon arrival the inspector on the ground condemned one and it was shipped back to the forge.

A replace was gotten out which, as the manager says, "we knew more about than the inspector could find out," and it was passed, shipped, passed again and installed. Meantime the condemned shaft had been stored in the yard, and one day, not long after the ship went into commission, a telegram was received stating that the second shaft had broken and ordering another rushed to replace it. After a decent interval the condemned shaft was hauled into the shop, cleaned up and shipped, was accepted and installed, and is still in service.

Changes of Specifications.

The specifications and contracts drawn by the department not only display the most amazing and exasperating lack of discretion in the requirements as to material, but leave the whole thing wide open for the bureau and their inspectors to roam at will, change, condemn and otherwise hamper and delay construction, and the contractor has no redress. The inevitable result is a cost out of all proportion to the goods delivered.

The department prepares only general plans—all detail or working drawings must be made by the contractor and approved by the bureau having jurisdiction over the work under construction, and, aside from the fact that the various bureaus all have to be satisfied and that they are continually at loggerheads amongst themselves as to authority, weights, space, etc., the dilatoriness of the department in acting on such plans make quick or economical work utterly impossible. Only recently the chief engineer of an eastern concern with naval contracts was expressing himself to the writer over a delay of more than six weeks in getting action on certain plans prepared in harmony with the ideas of the constructor on the ground and sent to Washington for approval only to have the whole arrangement rejected. How is it possible for any contractor to make headway under such a system? Even the smallest and most insignificant detail must go through the same process. It matters not that the contractor may have a pattern or design for some part used for the same purpose on an exactly similar ship; if a different constructor happens to think he would

like it otherwise it must be made otherwise.

Reckless Disregard of Cost.

The constructor's power is unlimited. He can compel the tearing down of work already done and on the flimsiest pretexts. He need give a reason to no one. An examination of the design of details will disclose either the densest ignorance and lack of judgment or else the most reckless disregard of cost; in either case the result is the same. For instance; the turrets of a battleship of modern type are carried on conform rollers running on a track made of cast steel segments supported by two concentric rings of steel plate about 2 ft. apart. Between these rings are fitted, at intervals of about 4 ft., spreaders or distance pieces, bolted to both. The entire office of these spreaders is to maintain the rings in a fixed relation to each other. So far as actual strains are concerned good cast iron would probably answer every purpose. But cast iron is not always a reliable material, and if a better is wanted here cast steel is ideal and not expensive under ordinary inspection. But it is too cheap for the navy man. He must have nothing but bronze, and navy bronze at that, known throughout the trade as one of the most expensive alloys. Can any one say why, if the rings are good enough in steel and the track is good enough in steel, the navy must throw away tons and tons of bronze, costing approximately six times as much as steel castings and having a strength of approximately one half?

On one of the recent battleships I noticed the deck scuttles in the lower deck, over the bunkers. In general arrangement they are similar to those used in all classes of ships. They consist of three parts; the deck ring, about 3 ft. diameter, with a grating and water tight cover. They are not exposed to the weather or to severe service of any kind and there is no good reason why cast iron is not just as suitable for them in a naval ship as in any other ship. The only reason for a water-tight cover even is the scrubbing down of decks. But the navy must have bronze, and not only that, but they must be finished all over. I saw a workman accurately sizing, with a file and calipers, the thickness of the bars of the grating and was told by the official in charge that the inspector had so ordered because the drawing called for a certain thickness (as of necessity it must) and that the thickness must be exact.

Those scuttles cost 20 times as much as similar fittings on the best passenger ship, and the navy, the ship or her crew, are not benefited an iota.

Waste of Labor and Material.

The prodigality in the use of brass and copper where iron or steel would answer every purpose either for safety or durability is nothing less than criminal. And, as for durability, almost before our best battleships have had time to acquire a growth of barnacles we are told they are obsolete. A visit to any navy yard will disclose vessels laid up and out of service that we only a few years ago were told were urgently needed, and not even laid up with the care of the ordinary merchantman or any attempt to keep "shipshape". Guns pointing at all angles, some without tompions; wood decks shrinking and splintering in the sun and weather for want of a wetting down; chains, lines and hawsers snarled and fouled; tattered tarpaulins adrift and waving in the breeze; mooring lines without a bit of "chafing gear;" even a gangway gone adrift while a lazy watchman snored his head off in plain view of every passer-by. I could multiply without end instances of waste of labor and material which cannot fail to strike the trained observer. Ponderous bronze valves and fittings, away below the water line, for service where the pressures under no possible conditions or circumstances could exceed a few pounds and cast iron or steel would serve every purpose; mammoth copper exhaust pipes, not even so good as steel but costing many times more and all to be thrown away after a few months of actual service; for it must be remembered that the naval ship does not pass but a small percentage of her actual commission under way at sea.

(To be continued.)

THE CLERMONT LAUNCHED.

The Staten Island Ship Building Co., Mariners' Harbor, Staten Island, N. Y., launched the replica of the steamer Clermont, Robert Fulton's pioneer steamboat, on July 10 in the presence of about 7,000 persons.

The Clermont is being duplicated by the commission in charge of the Hudson-Fulton celebration which is to take place on the Hudson river beginning Sept. 25 and continuing to Oct. 9, and for which pageant Hendrik Hudson's Half Moon has been reproduced in Holland and brought to this country to take part.

The Clermont was christened by Mrs. A. T. Sutcliffe, the great-granddaughter of Robert Fulton, who broke a bottle over the bow filled with water from a well on the Livingstone estate at Clermont on the Hudson. At the instant that the bottle was broken six carrier pigeons were released, each of which bore a quotation from Robert Fulton's essay on the "Friends of Mankind." The quotation reads: "Industry will give abundance to a virtuous world and call mankind to one unbounded feast of harmony and friendship."

The bell of the original Clermont has been presented to the commission by E. E. Olcott, president of the Hudson River Day Line.

An exact duplicate of the engine of the original Clermont is also being constructed by the Staten Island Ship Building Co., the only variations being those made necessary by the present-day inspection laws.

When the Clermont appears in the celebration she should present a striking object lesson of the progress which has been made in the science of ship building during the past century.

NEW HALF MOON HERE.

The Holland-America liner Soestdyk arrived in New York July 22 carrying on her deck an exact reproduction of the vessel in which Capt. Hendrik Hudson made his first voyage up the Hudson river 300 years ago. The "Half Maen," as the Dutch have it—has been built in Amsterdam, Holland, by public subscription under the patronage of some of the highest personages of that country. She is Holland's contribution to the Hudson-Fulton celebration commemorating the discovery of the Hudson river in the original Half Moon as well as the epoch-making voyage of Robert Fulton in his steamboat in those same waters.

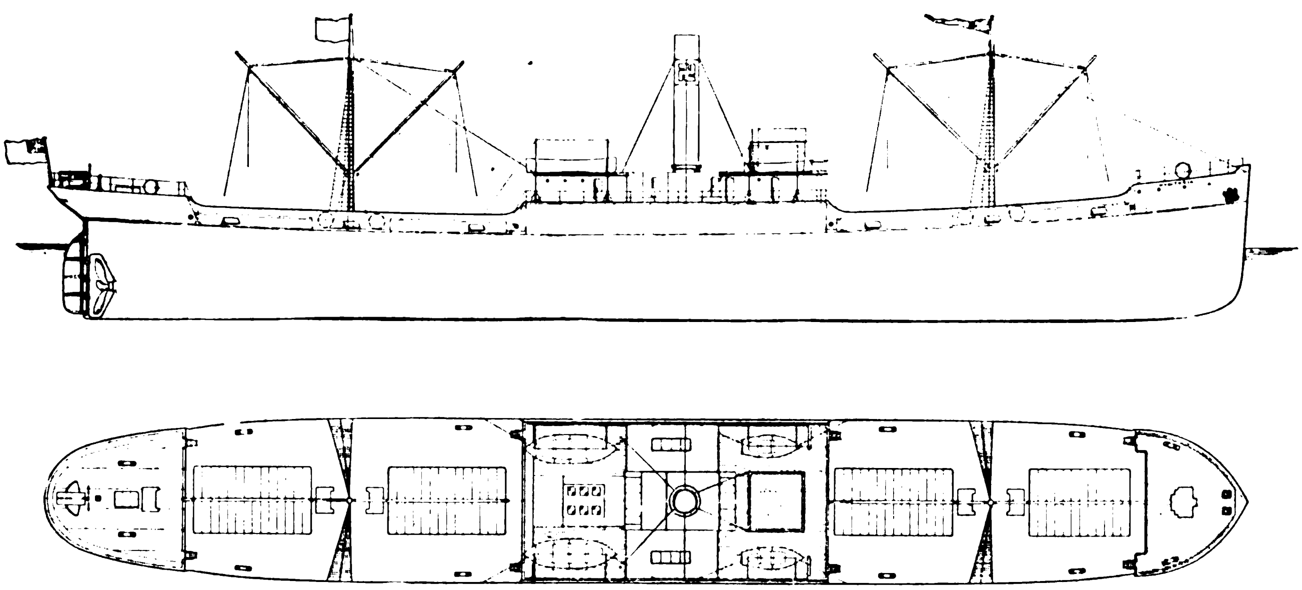
The Half Moon is built of heavy oak timber, with the high poop and long-nosed prow characteristic of the ancient Dutch and Spanish galleons. She is of about 80 tons displacement, is 74½ ft. long and has a beam of 18 ft. She draws 7½ ft. of water and will carry a crew of 20 men.

An interesting feature of the pageant will be the presence of the fifth cruiser squadron of the British navy, which has been ordered to attend. This squadron, consisting of four vessels, the Drake, the Argyll, the Duke of Edinburgh and the Black Prince, will be under the command of Rear Admiral Frederick T. Hamilton, who is to act in the capacity of official representative of the British government at the festivities, which will begin Sept. 25 and continue to Oct. 9. All of the

ships are of the armored cruiser class, and with the exception of the Drake have been but recently put into commission and they thus represent the modern type of British naval construction.

The Patent Steamer Monitoria

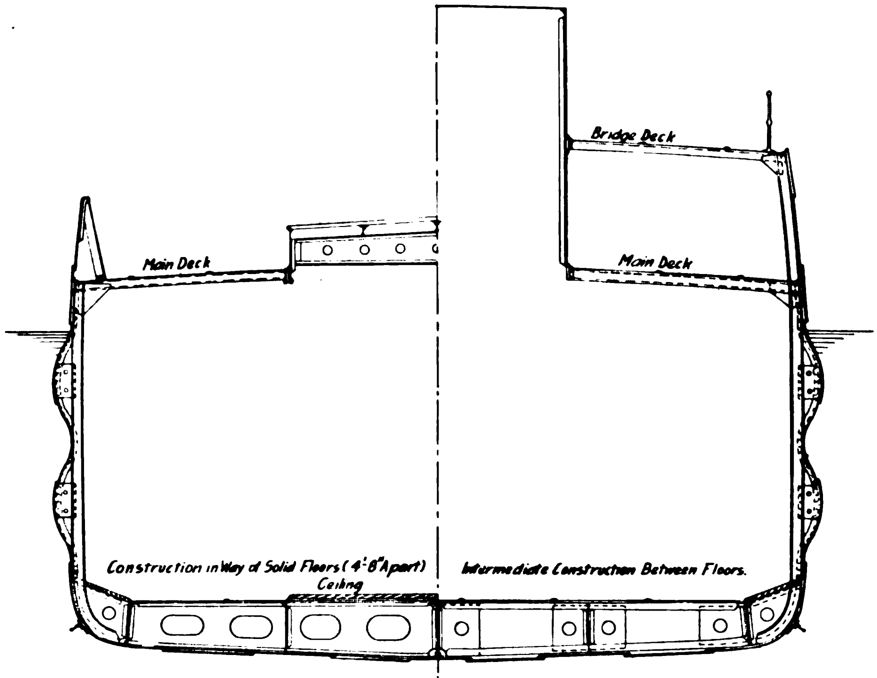
CONSIDERABLE interest has been created in British ship building circles in the launch on July 5 of the steamer Monitoria, a new vessel which constitutes an innovation in ship building.



PROFILE AND DECK PLAN OF PATENT STEAMER MONITORIA.

The vessel is being constructed by Messrs. Osbourne Graham & Co., Sunderland, to the order of the Ericsson Shipping Co., and her distinctive feature is that she is built according to the patented design of the Monitor Shipping Corporation, Ltd. This design includes a departure from the accepted form of hull to the extent that below her water line on both sides there are two longitudinal projections or swellings of the shell plating with a slightly hollowed groove between them. These corrugations, whilst giving the vessel greater strength and adding to the carrying capacity, will also, the inventors anticipate, tend to increase the speed of the vessel by at least 10 per cent over the ordinary design of ship, while the other advantages may be summarized as follows: Displacement increased; increased speed with the same displacement or less horsepower to give the same speed, although there is more displacement to propel; less coal consumption; steadier vessel at sea; rolling reduced; greater strength longitudinally, laterally, and to resist crushing strains; and diminished wave disturbance. The change, it is claimed, is absolutely contrary to all theory and book law, for naval architects up to the present time have all agreed that the greater the wetted surface in the hull of a ship the more difficult the vessel was to drive. The depth of the projections mentioned have, it is understood, only been arrived at after many years of careful experiment, and the inventors have found, by testing with models, that the projections on the Monitoria are almost ideal for obtaining an increase of speed. Curiously enough when the size of the projections was decreased, the tests proved a proportionate decrease in speed.

Improvements in ships during the last 30 years have almost exclusively lain in the direction of modifications to the inside of the vessel in order to gain a better disposition of material and strength. In the case of the Monitoria, however, the innovation is connected with the outside underwater body of the ship, and despite which the inventors—the prime mover amongst whom is A. H. Haver, M. I. N. A, formerly with Messrs. W. Doxford & Sons, Ltd., the patentees of the turret type of steamer—claim that these wave-like projections or corrugations will cause a diminution of resistance. In the new vessel the usual contour of the vessel is altered. The wave-like swellings lie between the load water line and the bilge, and extend along the vessel to about the turn of the bows and quarters, where they gradually merge into the usual ship ending. In the earlier experiments of the designers, a groove in the side of the vessel was tried. Very good results were obtained, but from a commercial standpoint, a groove placed on the outside of the vessel was better, as it was easier of application, cheaper in practice, whilst there is scarcely any difference in its resulting efficiency upon the undulating stream lines. The evolution developed, therefore, into the two projections fitted on the Monitoria, which add to the displacement, the draught being slightly increased, with consequently increased deadweight; but, if normal speed is intended, smaller engines can be fitted into the ship which in its turn means less weight and less coal consumption, so that altogether a smaller ship can be got to do the same work required when these Monitor projections are fitted. Besides, it is claimed that the form of the projections add considerably to the strength of the vessel laterally, vertically and locally. The form, as adopted in the Monitoria, will give nine times more crushing strength against quay walls than the resistance of a flat plate, and is also of such strong sections that the British Corporation and Lloyd's Registry have both allowed reduced scantlings. The patent can be applied to old vessels, all that is required being the taking out of three or four strakes of plates and replacing these with corrugated plates after the patentee's plans. Patentee has also arranged that any builder may build vessels of this type on royalty terms. As Messrs. Osbourne Graham & Co. have built a very large number of similar sized vessels to the Monitoria, but of ordinary form of construction, they



MIDSHIP SECTION OF PATENT STEAMER MONITORIA.

Crown of monitor corrugation 11¼" from main frame.
Main frames 8" x 3" bulb angles spaced 28" apart.
Corrugated frames 3½" x 3" plain angles attached to each main frame.
Corrugation gusset plate at each frame.
No side stringers.

ADVANTAGES.

Substantial increase in speed with same power and consumption, or same speed as normal vessel but with less power and consumption.

Extra strength in form of design.

Resistance against rolling.

Increased cubic feet capacity.

No increase in tonnage.

Monitor design can be quickly applied to any ordinary vessel at little cost.

will be able to obtain exact data when comparing the speeds of the patent ship on loaded trials with the older type of craft.

It may be added that the Monitoria is 279 ft. by 42 ft. by 20 ft. 7½ in., and her deadweight capacity for bulk cargoes is about 3,300 tons, about 90 or 100 tons of which is gained by the introduction of the projections on the sides of the ship.

The curious formation of the hull was carefully inspected by a large number of experts before the launch, and at the luncheon which followed A. H. Haver made some interesting remarks concerning the innovation. He said when the idea embodied in that vessel was first suggested to him he gave a strong adverse opinion. He believed with most naval architects that the wetted area was a sure index to the horsepower of a ship. He commenced he trial "with a strong prejudice against the idea. The first trial resulted in a saving of 8 per cent in horsepower. A few months later he came to the conclusion that the idea was an improvement. He had no fault to find with sceptics who did not exactly see that it could possibly be an improvement, for he had gone through that phase himself. It had taken him many months to come to the conclusion that his ordinary education in ship resistance was a little deficient. They had in the Monitoria a vessel that would carry a hundred tons more deadweight, and have the same speed as a sister ship of the ordinary type on less horsepower. This was brought about by the extra buoyancy of the projections and the steadying effect they had upon the waves and stream lines created by the passage of the ship. He conceived that these stream lines and waves had the same effect that a bumpy road had upon a road vehicle. In proportion to the magnitude of the waves or road equalities, so in both cases would their horizontal speed be reduced by the power consumed in the vertical lift and fall. Therefore, let them reduce the unevenness of a road or the amplitude of the waves round the ship, and in both cases they saved power expended vertically and applied it horizontally, thereby getting greater speed with the same original power. The Monitoria would not have a trial trip in the ordinary way, because that was only to test the engines. But she would be tried on several ocean voyages. He anticipated that the improvements he felt sure they would get would be on the second or third voyage. The projections were not fixed by guesswork. It was just as necessary to get them to suit the ship as to get the length of a pendulum o suit a clock. This build also gave extra strength which Lloyds and the British Corporation had recognized in the reduction of scantlings. The Monitoria company was not a ship building or ship owning company, but a company to follow out and develop certain patents.

Axle F. Ericsson, responding to the toast of the ship, said the patent designs of the Monitoria were granted in September, 1905, and during the whole of the four intervening years Mr. Haver had applied himself to its practical application with the utmost energy and ability. But for Mr. Haver that patent could not possibly have been carried to its present successful issue. He believed the Monitoria company was a most valuable branch, which, as time went on, would give employment to ship builders all over the country. The vessel was named after the Monitor, built by the well-known Swedish engineer, John Ericsson, in 1862, and which defeated the Merrimac in the same year, an achievement for which every American citizen was grateful today.

The engines of the Monitoria will be supplied by the Northeastern Marine Engineering Co., and will have cylinders 21 in. by 56 in. by 36 in.; two boilers 13 ft. by 10 ft., working at 180 lb. pressure. The estimated speed of the vessel at sea loaded is 11 knots with an easy coal consumption.

PROPOSED NEW SHIP YARD AT SEATTLE.

Philip D. Sloan and others, of Seattle, have incorporated the Sloan Ship Building Co., with Philip D. Sloan, president and treasurer, and George D. Sloan, secretary.

The company has leased a tract of land at West Seattle just south of the anchorage of the Seattle Yacht club upon which it expects to erect an extensive plant in the near future. The cost of the proposed plant is estimated at $120,000. The plant will be equipped to build both wooden and steel vessels and will also be provided with a floating dry dock 200 ft. in length and 74 ft. in width in the clear.

LAUNCH OF THE MELTONIAN.

On Thursday, July 8, Messrs. Harland & Wolff, Ltd., launched from their south yard the steel screw steamer Meltonian for the Wilsons & Furness-Leyland Line, Ltd. The Meltonian is a sister ship of the Median, Memphian and Mercian, constructed by the same builders. The vessel has been built under board of trade survey for passenger certificate. She will have quadruple-expansion engines, an installation of electric light, as well as the latest and most improved facilities for working ship and cargo.

Lake Shipyard Methods of Steel Ship Construction

By Robert Curr.

On the great lakes the ton weight is 2,000 lb. In some cases 2,240 lb. constitute a ton and the term used is "gross tons."

This is somewhat confusing, seeing that gross tons is the term applied to the register tonnage.

Long tons for 2,240 lb. and short tons for the 2,000 lb. value would be less liable to mix matters.

Gross tons on a ship is understood to mean the gross register tonnage which is a statutory measurement unit established by law, and is the internal cubical capacity of the vessel divided by 100.

Fig. 53 shows one of the largest vessels on the great lakes ready for sea. The boilers are full of water and 75 tons of coal on board. Dimensions are:

Length over all, 605 ft.; length between perpendiculars, 585 ft.; breadth molded, 60 ft.; depth molded, 32 ft.; depth at center, 33 ft.; depth of water bottom, 5 ft. 6 in.: depth of water bottom at side, 21 ft.; width of water bottom at side, 7 ft. 6 in.; draught forward, 4 ft 2¾ in.; draught aft, 8 ft. 7 in.; draught mean, 6 ft. 4⅞ in.; light displacement, 5,860 tons; ore carried on 20 ft. draught, 2,240 lb. per ton, 12,380 tons; coal carried on 20-ft. draught, 2,000 lb. per ton, 13,866 tons; wheat, 514,050 bu.; gross register tonnage, 7,962; net register tonnage, 6,189.

The describing of the above items will be better understood by reference to Figs. 54-65.

Fig. 54 shows three plans, viz.: Sheer, spar deck and tank side top.

On sheer plan the length over all is shown 605 ft., also the length between perpendiculars, 585 ft.

The length over all is measured from the foreside of the stem to the after end of the spar deck on the center line of the ship. Length between perpendiculars is the distance from the after side of the stem to the foreside of the stern post.

The dotted line on the top plan (the sheer plan) shows the height at center. The full line below is the molded height.

The tank side line takes the place of the main deck line and runs parallel to spar deck or molded height, being 11 ft. below same. On the sheer plan the tank top line is also shown 5 ft. 6 in. above the inside of keel plate.

Tank side top plan, Fig. 54, shows both sides of the vessel, while the spar deck only shows the half plan.

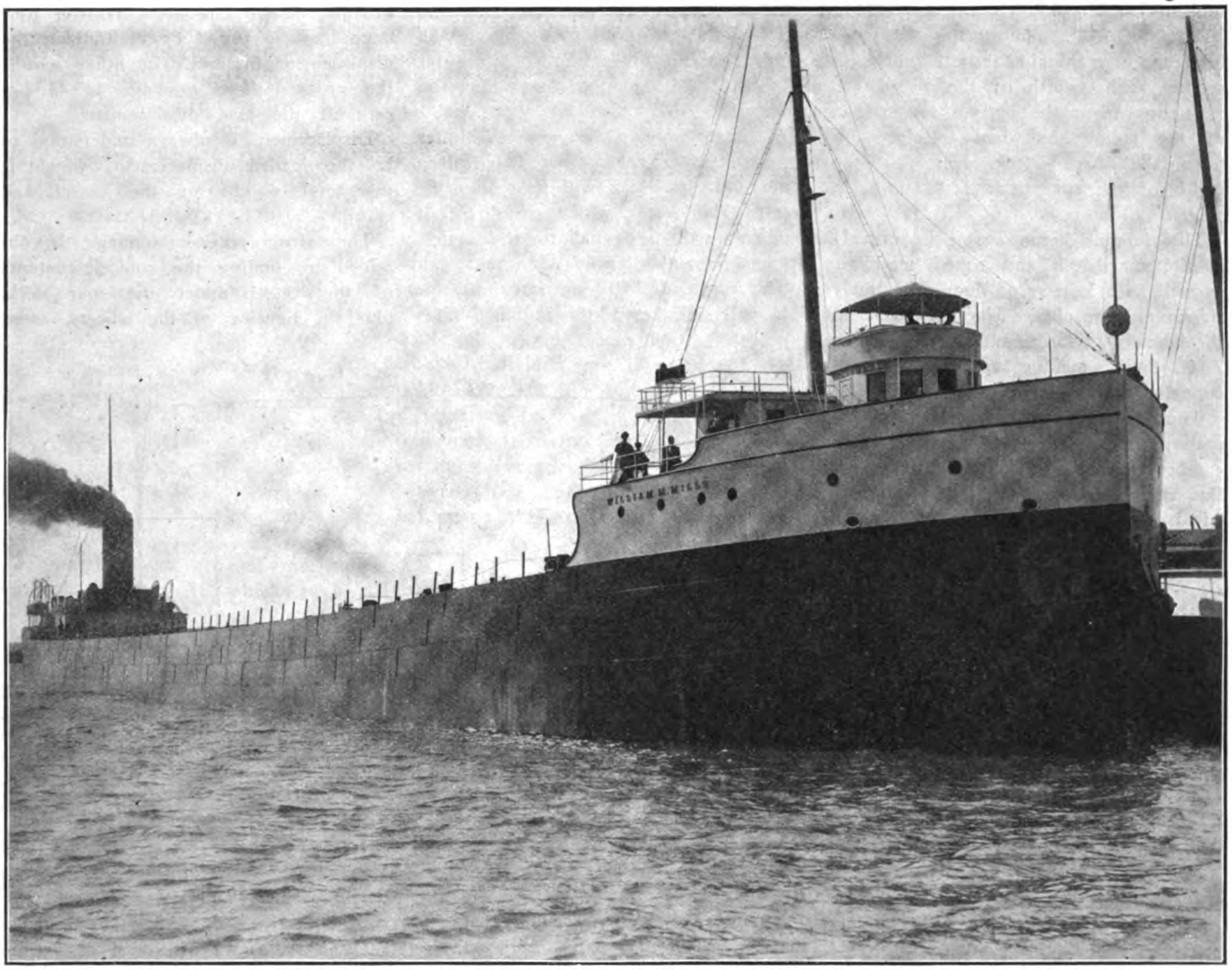
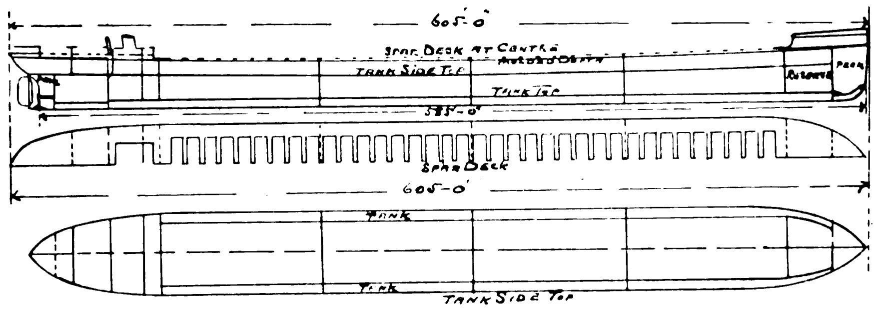


Fig. 53.



— Fig 54 —

Fig. 55 shows the outline of the midship section of this vessel.

The dotted line shows the difference between a rectangle and the midship section. The width of the vessel (60 ft.) runs from the bottom to the top of the tank side when it closes in towards the spar deck, decreasing the width of the spar deck 1 ft. on each side.

This humble home (as it is termed) at the spar deck and round of bilge, as well as 3 in. rise of floor are clearly shown on this plan. The hold between the hoppers is 45 ft. and the side tanks 7 ft. 6 in., making up the width of 60 ft.

The dotted line drawn across this section at spar deck shows the 12 in. camber of beam and the short dotted line at center shows 4 in. below crown of beam, being one-third the round of beam, making the measurement of the depth at center above the tank top 27 ft. 2 in.

W. L. shows the draught this vessel floats at when ready for sea.

This is the water line for light displacement and when the vessel floats at this line she weighs 5,860 tons.

Fig. 56 is a longitudinal view of this vessel showing the draught forward and aft. The draught forward is 4 ft. 2¾ in., and aft 8 ft. 7 in., which shows the vessel trimmed by the stern.

The difference of the draught is caused by the machinery and boilers being aft.

When the vessel is loaded she sails to port on an even keel.

Were this vessel completed when launched, as shown by Fig. 57, she would push aside a quantity of water weighing 5,860 tons.

Fig. 57 is a good example of displacement. The foam shows the water being dislodged. If it were possible to receive this water in some other cavity, such as a basin alongside the deck, and by having means to weigh same, it would be found that the water was equal in weight to the vessel launched.

A simple way to prove this matter is to fill a bowl with water and drop some obstacle which will float into the bowl. The water which overflows, if weighed, will be equal to the article dropped into the bowl.

The cargo, 12,380 tons, put into this ship will sink her 13 ft. 7⅛ in. This is termed the useful displacement, being the earning part.

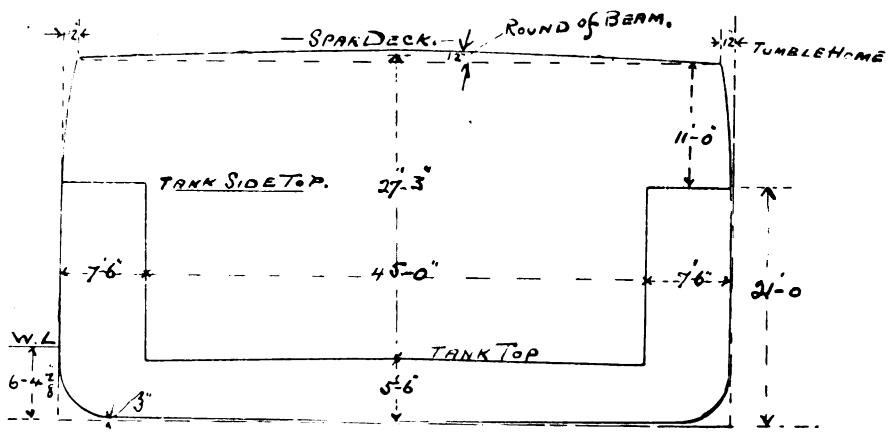


Fig. 55.

Thirteen ft. 7⅛ in. equals 163⅛ in.

$$\frac{12,380}{163\frac{1}{8}} = 76 \text{ tons.}$$

This result shows that it will take 76 tons to sink this vessel 1 in. and is termed "tons per inch immersion."

This will show that the displacement varies owing to the amount of cargo put on board the vessel. There never should be any difference in the light displacement unless water has been left in the water bottom.

The light displacement can be arrived at by

$$\frac{585' \times 60' \times 6' - 4\frac{7}{8}'' \times 0.94}{36} = 5,860 \text{ tons}$$

and the same calculation for the load displacement

$$\frac{585 \times 60 \times 20 \times 0.94}{36} = 18,240$$

being the total light and loaded displacement.

The gross register tonnage is 7,962 tons, but has no relation to the design of the vessel. The gross register tonnage may be found by multiplying the displacement by 0.43. In other words, the gross register tonnage is 43 per cent of the load displacement.

Displacement is always understood to be the loaded displacement, which is the total weight of the vessel and cargo.

The gross register tonnage is obtained by finding the cubical contents of the vessel under the spar deck, plus the housing of the officers, crew, staterooms, space inside engine and boiler casings, and other erections.

Sections 1, 2, 3, 4, 5, 6, 7, 8 and 9 show cross views of vessel at various parts of her length.

This section cannot be treated as a rectangle, so that ordinates have to be run in, as shown by Fig. 59, the method for calculating displacement. This method is in common use with naval architects in figuring out displacement.

Fig. 59 shows 234 ft. of the vessel and is divided lengthways into four equal parts, and vertically between keel and load water line into ten equal parts.

The water planes are 2 ft. apart and the vertical section 58.5 ft. apart.

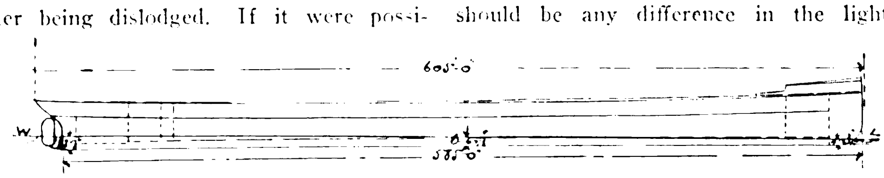


Fig. 56.

AREA OF WATER PLANES.

Nos. of ordinates.	Half ordinates.	Multipliers.	Products.
1	30	1	30
2	30	4	120
3	30	2	60
4	30	4	120
5	30	1	30
			360
		58.5	19.5
		3	7,020
			2
Water plane area in sq. ft.			14,040

The above table shows the method of calculating the area of the water plane as the load water line.

This section is a rectangle and can be calculated by multiplying the length and breadth together, $60 \times 234 = 14{,}040$, which is the same result as above. This being only the square feet of top surface or area of plane the cubical contents have to be found. This is done by putting the area of the planes under the same process. Ex.:

CUBICAL CONTENTS.

No. of areas.	Areas.	Multipliers.	Products.
1	14,040	1	14,040
2	14,040	4	65,160
3	14,040	2	28,080
4	14,040	4	56,160
5	14,040	2	28,080
6	14,040	4	56,160
7	14,040	2	28,080
8	14,040	4	56,160
9	14,040	2	28,080
10	14,040	4	56,160
11	0	1	0
			407,180
			2
		⅔ =	3)814,360
			271,453 cu. ft.

The water planes are all the same except the bottom 11 which rises 3 in. A half ordinate should be put in between 10 and 11, but this is near enough as an example for the measurement of register tonnage.

The only thing to be considered in this calculation is the loss of area caused by the rise of floor and bilge rounding, which could be arrived at by a certain percentage to the box form. Example:

$234 \times 60 \times 20 \times 0.96 = 271{,}453$ cu. ft.

Four per cent is the loss in rising the bottom and rounding the bilge, compared to a box shape.

The ends are formed so that the entrance and exits may be easy, in which case the above calculations will be found correct.

In calculating the gross tonnage of a vessel in this example the length would be divided into 16 parts and the depth into six.

Referring to Fig. 55 the tonnage is measured from the tank top to the height shown, 27 ft. 2 in., and width between the hoppers 45 ft. to the height of the side tank. Above the side tank the width would be taken to the outside of the frame which would be treated separately. Fig. 60 a copy of the ship's certificate of register which shows two kinds of register, gross and net, is not reproduced in this article.

The net tonnage is the principle on which taxation is based and will be best illustrated by printing the act passed in the year 1895. Chap. 173:

"An act to amend section one of chapter 398 of the laws of 1882, entitled 'an act to provide for deduction from the gross tonnage of vessels of the United States.'

"Be it enacted by the senate and house of representatives of the United States of America, in congress assembled, that section one of chapter 398 of the laws of 1882, approved Aug. 5, 1882, entitled 'an act to provide for deductions from the gross tonnage of vessels of the United States' be amended so as to read:

"That section 4,153 of the revised statutes of the United States be amended by inserting before the last paragraph thereof the following words: 'That from the gross tonnage of every vessel of the United States there shall be deducted—(a) The tonnage of the

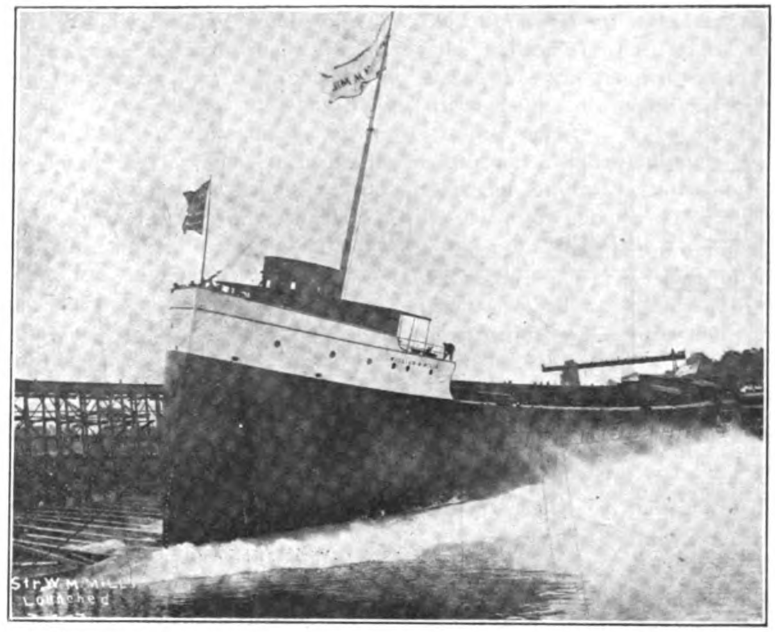


Fig. 57.

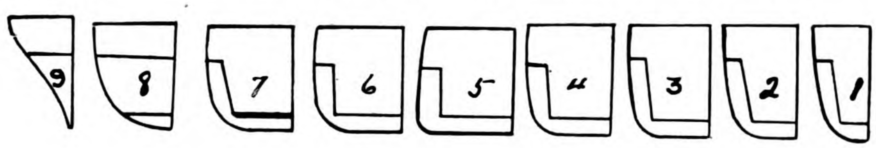


Fig. 58.

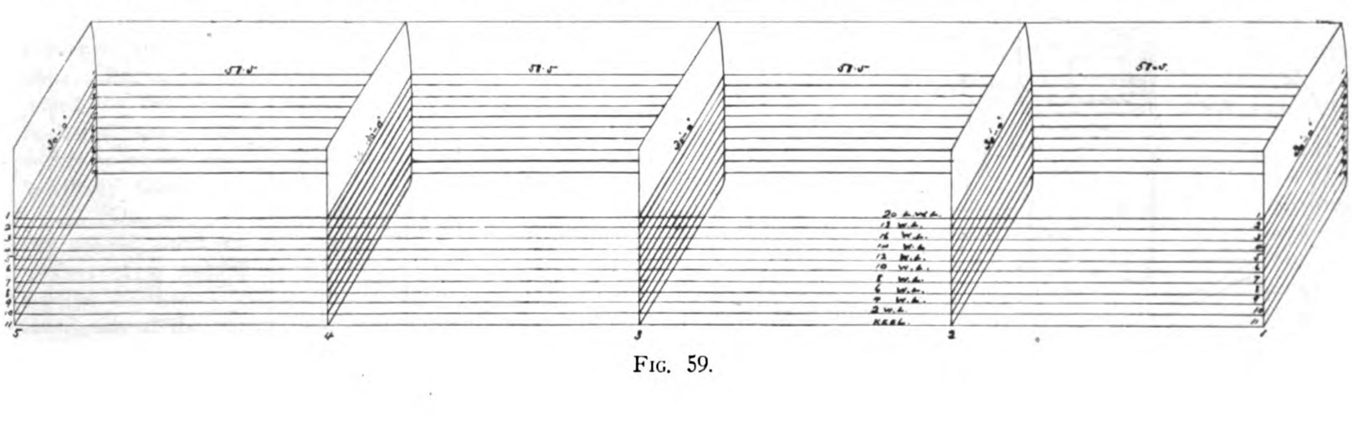


Fig. 59.

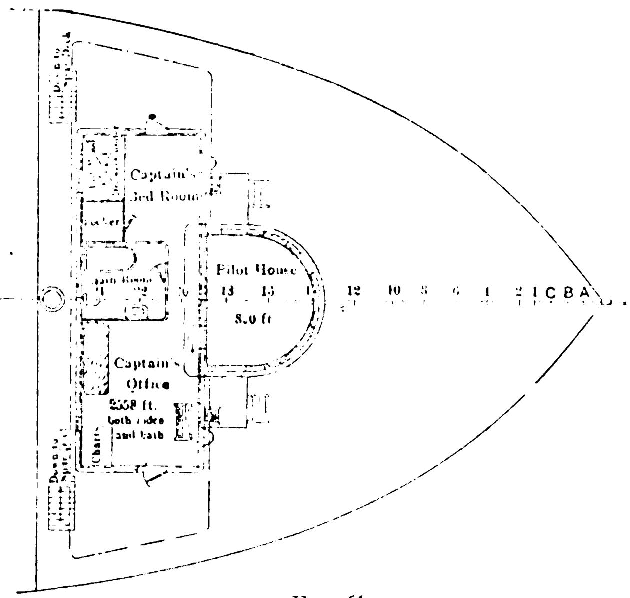


FIG. 61.

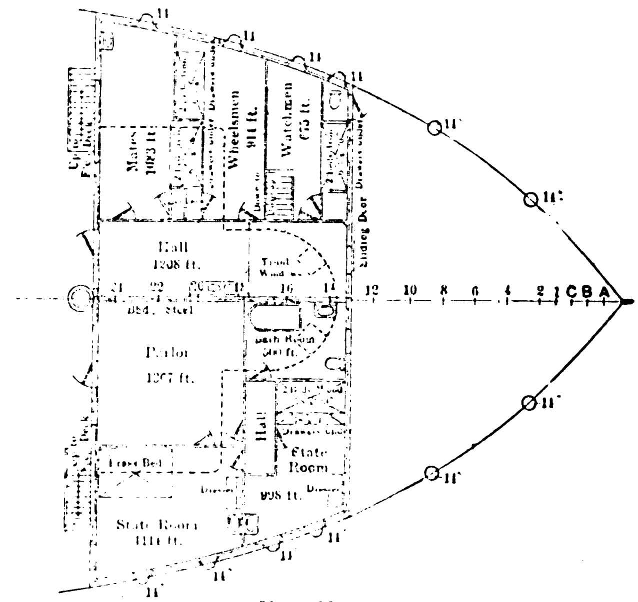


FIG. 62.

spaces or compartments occupied by or appropriated to the use of the crew of the vessel. Every place appropriated to the crew of the vessel shall have a space of not less than 72 cu. ft. and not less than 12 superficial ft., measured on the deck or floor of that place, for each seaman or apprentice lodged therein.

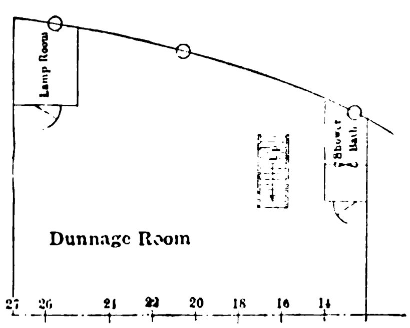


FIG. 63.

"Such place shall be securely constructed, properly lighted, drained and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from the effluvium of cargo or bilge water; and failure to comply with this provision shall subject the owner to a penalty of $500.

"Every place so occupied shall be kept free from goods or stores of any kind not being the personal property of the crew in use during the voyage; and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged in that place the sum of 50 cents a day for each day, during which time any goods or stores as aforesaid are kept or stored in the place after complaint has been made to him by any two or more of the seamen so lodged.

"No deduction from tonnage as aforesaid shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate with these words: 'Certified to accommodate —— seamen.'

"(b) Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words 'certified for the accommodation of the master,' to be permanently cut in the beam and over the door of such space.

"(c) Any space used exclusively for the working of the helm, the capstan and anchor gear, or for keeping the charts, signals and other instruments of navigation and boatswain's stores, and the words 'certified for steering gear,' or 'certified for boatswain's stores,' or 'certified chart house,' as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

"(d) The space occupied by the donkey engine and boiler, if connected with the main pumps of the ship.

"(e) In case of a ship propelled wholly by sails any space, not exceeding $2\frac{1}{2}$ per centum of the gross tonnage, used exclusively for storage of sails, provided that spaces deducted shall be certified by the collector to be reasonable in extent and properly and efficiently constructed for the purposes for which they are intended, and the words 'certified for the storage of sails' to be cut on the beam and over the doorway of such space.

"(f) In the case of a ship propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made as follows: 'In ships propelled

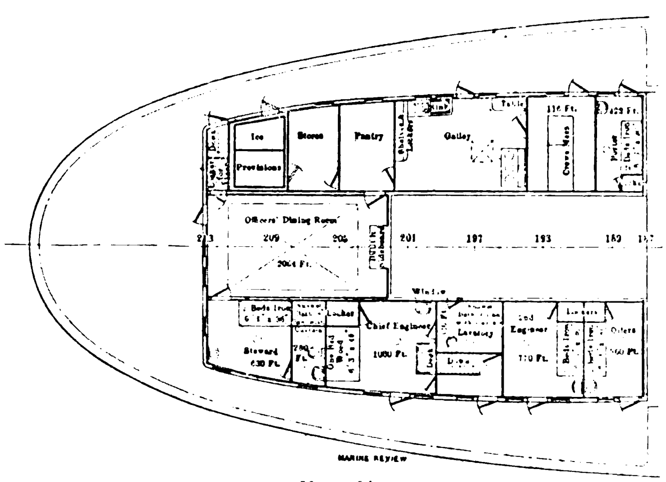


FIG. 64.

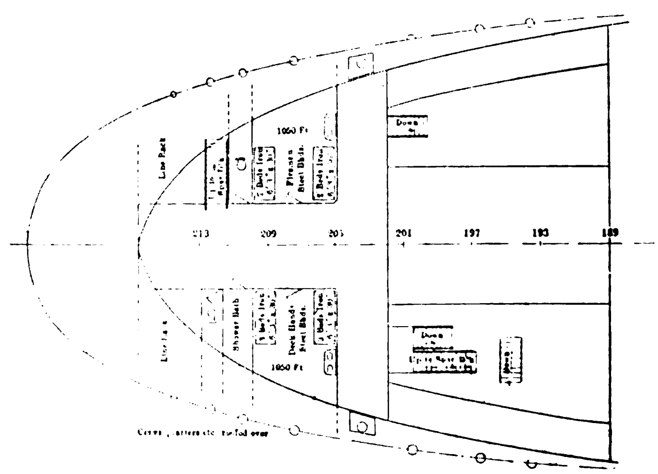


FIG. 65.

by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above 20 per centum and under 30 per centum of the gross tonnage, the deductions shall be 37 per centum of the gross tonnage; and in ships propelled by screws in which the tonnage of the space is above 13 per centum and under 20 per centum of the gross tonnage, the deduction shall be 30 per centum of the gross tonnage. In the case of the screw steamers the contents of the trunk shaft shall be deemed spaces necessary for the proper working of the machinery.'

"(g) In the case of the other vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to 20 per centum or under and in the case of screw vessels to be 13 per centum or under of the gross tonnage of the ship, the deduction shall consist in the case of paddle vessels of once and a half the tonnage of the actual machinery space and in the case of the screw vessels of once and three-fourths the tonnage of the actual machinery space. But if actual machinery space is so large as to amount in the case of paddle vessel to 30 per centum or above of the gross tonnage of the ship, the deduction shall consist of 37 per centum of the gross tonnage of the ship in the case of a paddle vessel and 32 per centum of the gross tonnage in the case of a screw vessel, or if the owner prefers there shall be deducted from the gross tonnage of the vessel the tonnage of the space or spaces actually occupied by or required to be inclosed for the proper working of the boilers and machinery, including the trunk shafts or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of 50 per centum, and in the case of vessels propelled by screws of 75 per centum of the tonnage of such space.

"(h) If there be a break, a poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained and added to the gross tonnage. Provided, that nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not enclosed.

"(i) On a request in writing to the commissioner of navigation by the owners of a ship the tonnage of such portion of the space or spaces above the crown of the engine room and above the upper deck, as is framed in for the machinery, or for the admission of light and air and not required to be added to gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage. Such space or spaces must be reasonable in extent, safe and seaworthy, and cannot be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the ship.

"And the proper deduction from the gross tonnage having been made, the remainder shall be deemed the net or register tonnage of such vessels.

"The register or other official certificate of the tonnage or nationality of a vessel of the United States, in addition to what is now required by law to be expressed therein, shall state separately the deduction made from the gross tonnage, and shall also state the net or register tonnage of the vessel.

"But the outstanding registers or enrollments of vessels of the United States shall not be rendered void by the addition of such new statement of her tonnage, unless voluntarily surrendered; but the same may be added to the outstanding document or by an appendix thereto, with a certificate of a collector of customs that the original estimate of tonnage is amended.

"In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall for the purposes of measurement be deemed to represent the floor timber.

"Upon application by the owner or master of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the secretary of the treasury, are authorized to attach to the register of vessel an appendix stating separately, for use in foreign ports, the measurement of such space or spaces as are permitted to be deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States.

"Sec. 2. That this act shall not be construed to require the re-measurement of any American vessel duly measured before April 1, 1895; but upon application of the owner of any such vessel collectors of customs shall cause such vessel, or the spaces to be deducted, to be measured according to the provisions of this act, and if a new register is not issued the statement of such remeasurement shall be attached by an appendix to the outstanding register or enrollment with a certificate of the collector of customs that the original estimate of tonnage is amended pursuant to this act.

"Sec. 3. That the provisions of this act requiring a crew space of 72 cu. ft. per man shall apply only to vessels the construction of which shall be begun after June 30, 1895.

"Sec. 4. That under the direction of the secretary of the treasury the commission of navigation shall make regulations needful to give effect to the provisions of this act.

"Sec. 5. That this act shall take effect on the first day of April, 1895.

Approved, March 2, 1895."

Fig. 61 shows the captain's quarters and pilot house; Fig. 62 shows the cabins and officers' quarters; Fig. 63 shows dunnage room; Fig. 64 shows galley, dining room and officers' quarters aft; Fig. 65 shows firemen's quarters.

The net tonnage of this vessel is 6,189 tons.

The hold is 447 ft. long and measures 610,706 cu. ft., allowing 4 per cent for taper of the ends would leave actual tonnage capacity of 586,278 cu. ft., equal to 5.862.78 net tons. The space in coal bunker reserve tank forward and sundries would make up the difference in the registered tonnage.

The gross register tonnage is 64 per cent of the cargo of ore and the net register tonnage is 77 per cent of the gross register tonnage. The gross register tonnage is 43 per cent of the displacement, which will be found nearly correct for all cargo vessels on the great lakes. The net register tonnage of passenger vessels is 55 per cent of the gross register tonnage.

The T. S. Marvel Ship Building Co., Newburgh, N. Y., has nearly completed the large floating dry dock which it is building for the Philadelphia Ship Repair Co. The dock will be towed to its destination at the foot of Mifflin street, Philadelphia. The dock is capable of lifting a vessel of 3,500 tons deadweight.

The Maryland Steel Co., Sparrow's Point, Md., is building a barge 224 ft. in length, 35 ft. beam, and 16½ ft. deep for the Barrett Mfg. Co., of Philadelphia. She is designed to carry 3,000 gallons of tar.

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SIMPLE SIMON'S PROGRESS.

We have grown to expect many things at the hands of our navy department, but levity is the latest. There is little suggestive of opera bouffe about steam trials of warships, yet beside the conduct of those of the Birmingham, Chester and Salem, the satires of "Pinafore" become as serious as *Punch*.

The reports given out by the navy department and published in the June MARINE REVIEW of the results of the first steam trials of these ships showed the Birmingham apparently lowest in daily coal consumption at all speeds; the consumption at 15 knots being stated as 71.23, 85.62 and 107.23 tons, respectively. The Salem was subsequently overhauled and the port turbine was found to be damaged by entrance of some foreign body, and her higher coal consumption was attributed to that. Now all these ships have undergone a second series of trials at 13.4 knots, with the result that the Salem is now lowest with 95 tons per day, the Birmingham next with 110 tons, and the Chester has moved up to 130 tons. It is reported that the department is in a quandary as to how to account for it.

THE MARINE REVIEW respectively suggests that the learned gentlemen forget it. Nobody wants them to account for it. Nobody believes either set of figures is worthy of credence. When the relative economy of three distinct types of motor depend for decision on the methods followed in these sham tests, the value of the decision will be nil. That the Salem would improve her performance might reasonably be expected, but that any such change in performance occurred as is shown for all three is utterly preposterous. The plan of determining coal consumption by bunker measurement contains too many elements of error to give it any standing whatever, even as a rough comparison. It is not necessary to speak of the various factors, every one of which is variable in itself, entering into the equation, but they are such that we wonder at their employment even by the navy department.

As to determining anything, the figures merely give added force to our remarks in the June number on "The Facts About the Turbine." The navy department has none too high a standing as it is without inviting ridicule by assuming responsibility for such results.

FOREIGN-BUILT YACHTS OWNED BY AMERICANS.

The new tariff bill, as reported on July 30 by the conference committee, contains the following provisions for the taxation of foreign-built yachts now or hereafter owned or chartered by American citizens:

Sec. 37. There shall be levied and collected annually on the first day of September by the collector of customs of the district nearest the residence of the managing owner, upon the use of every foreign-built yacht, pleasure boat, or vessel, not used or intended to be used for trade, now or hereafter owned or chartered for more than six months by any citizen or citizens of the United States, a sum equivalent to a tonnage tax of seven dollars per gross ton.

In lieu of the annual tax above prescribed the owner of any foreign-built yacht, pleasure boat, or vessel above described may pay a duty of 35 per cent ad valorem thereon, and such yacht, pleasure boat, or vessel shall thereupon be entitled to all the privileges and shall be subject to all the requirements prescribed by Sections 4214, 4215, 4217 and 4218 of the Revised Statutes and acts amendatory thereto in the same manner as if said yacht had been built in the United States, and shall be subject to tonnage duty and light money only in the same manner as if said yacht had been built in the United States.

So much of Section 5 of Chapter 212 of the Laws of 1908, approved May 28, 1908, as relates to yachts built outside the United States and owned by citizens of the United States is hereby repealed.

This section shall not apply to a foreign-built vessel admitted to American registry.

Under section 37 the following well-known yachts on Sept. 1 will be subject to the following annual tax:

James Gordon Bennett's Lysistrata, $13,594; W. K. Vanderbilt's Valiant, $12,761; A. J. Drexel's Margarita, $12,460; Mrs. Robert Goelet's Nahma, $12,173; Morton F. Plant's Iolanda, $11,529; Joseph Pulitzer's Liberty, $11,249; Eugene Higgins' Varuna, $11,011; George J. Gould's Atalanta, $9,121; Roy A. Rainey's Cassandra, $8,589; Fred W. Vanderbilt's Warrior, $7,679; C. K. G. Billings' Vanadis, $7,637; G. W. C. Drexel's Alcedo, $6,881; L. V. Harkness' Wakiva, $5,971; Cornelius Vanderbilt's North Star, $5,726; C. Ledyard's Diana, $5,495; F. G. Bourne's Delaware, $5,495; C. W. Harkness' Agawa, $4,214; John L. Livermore's Venetia, $4,116; Fred Gallatin's Riviera, $2,849; Mrs. O. B. Jennings' Tuscarora, $3,780; H. C. Pierce's Yacona, $3,689; Henry Walters' Narada, $3,430; F. L. Leland's Safa-El Bahr, $3,409; Edmund Randolph's Apache, $3,157; Ralph E. Towle's Athena, $3,129; A. E. Tower's Erl King, $3,101; W. S. Kilmer's Remlik, $3,024.

Besides the above, Americans own about 50 smaller foreign-built yachts on which the annual tax will range from $75 to $2,800, amounting to about $50,000 more, or in all about $235,000 annual revenue from this source.

Among the principal yachts built by American labor which do not have to pay the tax are:

	Gross tons.
Howard Gould's Niagara	1,433
O. H. Payne's Aphrodite	1,147
J. P. Morgan's Corsair	1,136
P. A. B. Widener's Josephine	974
James J. Hill's Wacouta	863
Archibald Watts' American	851
A. H. Burages' Aztec	848
Wm. B. Leeds' Noma	763
J. H. Ladew's Columbia	682
John Hays Hammond's Atrous	552
H. H. Rogers' Kanawha	475
A. V. Armour's Utowana	414
Hiram Sibley's Thetis	407
E. H. Harriman's Sultana	390

THE STRAW NAVY AND AMERICAN SHIPPING.

In reply to a letter from shipping interests on the Pacific coast protesting against the continued chartering of foreign tramps by the navy department for carrying eastern coal to the Pacific coast, and suggesting the use of western coal, thus keeping the foreign ships off the coast, Beckman Winthrop, acting secretary of the navy, attempts to justify the action of the department by saying that:

> The bureaus and officers who are responsible for the efficiency of our ships have uniformly taken the ground that our ships of war should only use the very highest grades of coal. In foreign ports they buy only Welsh coal from the Admiralty list, and in our own ports use Pocahontas and other of the New River coals, which are esteemed superior to the Welsh coal, the reason for this being that, as a matter of fact, the highest price coal is cheaper, as it contains a greater heat efficiency, and the still more important fact that it is not so subject to spontaneous combustion, and therefore will stand stowage in coal piles or in the bunkers of ships of war for a much longer period. The fact that the Comox and other Pacific coast coals are used by the Canadian Pacific and other ships trading on the coast, where this coal is used up in a very short time, does not prove that it can be used in furnaces of ships of war.

Mr. Winthrop further says:

> It is thought that the department need not assure you of its entire sympathy with the United States shipping interests.

We will admit at once that the secretary does not exaggerate in the least when he says that the navy uses nothing but the highest grade of coal. If there is any opportunity for spending money unnecessarily, the navy never fails to take advantage of it, but the man who is responsible for the statement that the eastern coal is cheaper to use because of its greater heat efficiency, whether he be secretary, bureau officer or office boy, is either not honest, or does not know what he is talking about. It is not the truth. It cannot even be distorted into any semblance of the truth. It is a plain, bald misstatement. So is the other statement about spontaneous combustion. Spontaneous rubbish. Does the secretary or his advisers imagine that nobody knows that there are ships on the Pacific coast which stow coal in their bunkers and leave it there for months, or that there are no coal piles other than those of the navy department? Does he not know that of all coal mined and shipped, his favorite Welsh coal is more subject to spontaneous combustion than any? If he does not, he does not know much about coal. Does he not know that, besides the Canadian Pacific express steamers, the ships of the British navy on the coast use local coal?

His statements, moreover, do not hang together. He speaks of the Pocahontas and New River coals as being esteemed superior to Welsh, manifestly because they must have higher heating value, whereas everyone who knows anything about coal, and many who know nothing about it, know that the contrary is the fact —that the highest heat value determination of any of the eastern coals is 14,800 B. T. U. per pound, whereas Welsh coal runs over 16,000, and therefore if heat value alone determined the choice of coal, the United States navy would burn nothing but imported Welsh.

Here let us note that Bulletin 378 of the U. S. Geological Survey, recently issued, which is written to demonstrate the advantages to the government of purchasing coal under a standard specification which bases the price upon the heating value of the coal, says:

> The navy department is a large carload consumer as well as a purchaser of large cargoes of coal for foreign delivery.

Mr. Winthrop says the navy buys nothing but Welsh in foreign ports. But in the entire list of contracts made under these specifications for the year 1909, the navy does not appear as a purchaser except in three eastern navy yards, where its favorite brand is on its own chosen ground and delivery can be made cheaply. Thus the government itself confounds the statements of the acting secretary and shows that the action of the department is influenced solely by its determination or anxiety to use eastern coal at no matter what cost and regardless of its real value or of the consequences.

Is our navy so restricted in its ability to do what others do? It is a queer comment on the judgment of our navy designers to say that our ships have been so designed that they can only use one grade of fuel. If so, it is merely another proof of the general inefficiency with which it has been so frequently and justly charged.

The statement has also been made that the boilers of our naval ships were not adapted to western coal. Not to waste time and space in argument, this is another flatfooted misstatement. There is no special design or arrangement of boiler required. There is not an engineer or shipbuilder in this country, or any other country, who will not ridicule such a statement. Ships go from all over the world to the Pacific coast, and coal there, and no one ever heard of such a thing until the navy needed a hole to hide in.

And once more, if our ships cannot burn Pacific coal in time of peace, what will they do in time of war? It is not a pleasant or well considered statement to give forth to the world on the authority of the secretary of the navy, that unless our ships can be be supplied with eastern coal or Welsh coal, they must stay in port.

The United States Geological Survey, a co-ordinate branch of the government, and which has no interest in misstating the facts, does not bear out the department's contention as to relative heat values. We do not deny that one pound of Pocahontas coal will evaporate more water than a pound of western coal, but we do deny absolutely that the difference is any greater than obtains between Pocahontas and many grades of eastern coal which are sold freely for steam purposes on the Atlantic coast and on the Great Lakes in competition with Pocahontas. There are no steamships in the world doing their work more economically than these same steamships on the lakes, and the heat value of 90 per cent of the coal which they use is no higher than that of some of the Washington coals, as shown by the geological survey. The survey's reports and tests on Pacific coast coals are naturally not by any means so extensive as on eastern and middle states coal, but in Bulletin No. 332, a report of the United States fuel testing plant at St. Louis, we find that Washington coal shows in four tests an average evaporative value of 8½ lbs. water per pound coal *as fired*, while West Virginia coal in 10 tests shows an

average of 9.05 lbs., or *six per cent higher efficiency.* Coal as fired is the test of comparative efficiency afloat.

The survey further says in its report on Washington coals:

The bituminous coking coals of Washington are the only coking coals on the Pacific coast of the United States, and the coals of New Castle and Renton in the South Puget Sound field are generally of high grade.

And again:

The steamship consumption in trade with Alaska and the Orient is now the most important market for the high grade bituminous coals of Washington.

Seattle harbor alone, which can accommodate the entire navy, has three large fueling docks, and of these, one company alone has an output of 4,000 tons per day, used almost entirely for bunkers, and which costs on board, untrimmed, $3.75 per gross ton. The freight alone on the cargoes now under charter from the Atlantic is $3.75 per ton, and this rate is particularly favorable and only obtained because the time of delivery allowed the foreign ships carrying it to arrive on the coast at an opportune time to secure grain and timber cargoes, thus in itself demonstrating that their presence is a disturbing factor. On the previous contracts the freight rate was about $7.00 per ton because the time of delivery was unfavorable for return cargoes.

If Mr. Winthrop expects to maintain his position as coal expert extraordinary, he will need to have the geological survey revise its reports.

His argument is as false as the assurance of sympathy. The navy has not now and never has had any sympathy with the merchant marine. Its whole effort and policy is to create support for a huge fleet of colliers under navy control. The MARINE REVIEW heretofore discussed this collier question, and it is not necessary to recur to it at this time. The navy is the worst enemy the merchant marine has, but there comes a day of reckoning for all, and that of the navy is at hand.

We have heard much of the incapacity and inefficiency of the Spanish navy, of the condition of its ships, and of late we have heard more or less, of a similar character, as to the French navy, but so far as administration is concerned, our own is no better. If our ships are better built or cared for, it is simply due to the inherent higher efficiency, man for man, of the American workmen and crews.

Besides all this, the chartering of foreign ships at all, at any price, is a flagrant violation of our own coasting laws, and the desire of the navy to help particular contractors and congressmen, and of the attorney genera', who gave an opinion in their support, must have been extreme when they overrode them. But after all, the most humiliating feature of the whole business is that the head of a great department should, over his own signature, assume responsibility for such puerile, unfounded statements in the attempt to bolster up and apologize for actions which bring the blush of shame to the face of everyone outside of the navy department.

A PROTECTED INDUSTRY.

If anyone doubts that Britain protects her shipping let him examine the British tariff commission's report on the engineering industries and he will be instantly pursuaded otherwise. Commenting on this report in so far as it applies to marine engineering and ship building the *Steamship* of London says:

The evidence shows the great stimulus given to the British engineering and shipbuilding industry generally by the system of Admiralty contracts. In effect these constitute a rigid system of protection, since builders for the Admiralty are expressly precluded from buying any materials except from British firms on the Admiralty list. As one experienced witness says:—"Our Admiralty authorities really specify the firms from whom we have to buy materials for British warships; they give us a list of makers and we may only go to a maker who is upon that list. If other manufacturers wish to qualify and apply to be put upon the list, the Admiralty make an examination of their works and add their names if they consider them eligible, and they generally do if the firms have any status at all. The battleship industry is really a protected industry as far as the British Admiralty is concerned. Nevertheless, we probably could not build a battleship appreciably cheaper if we were permitted to get our materials in any part of the world, excepting as regards such an item as shafting, for which we cannot obtain real competition amongst the British makers. On the whole cost of the ship, however, that is comparatively small. This system applies to everything we buy for the Admiralty. We get all the material for building a British battleship from British firms." Opinions differ as to the advantage derived by individual firms from particular Admiralty and other Government contracts, but the general impression is that the engineering and shipbuilding industry as a whole must necessarily derive considerable advantage from this system of Admiralty protection by reason especially of the security it gives to manufacturers for the employment of a definite amount of skilled labor, plant, and machinery.

Take the opening sentence: "The evidence shows the great stimulus given to the British engineering and ship building industry generally by the system of Admiralty contracts. In effect these constitute a rigid system of protection since builders for the Admiralty are expressly precluded from buying any materials except from British firms on the Admiralty lists."

We should say that it was a rigid system of protection. It is absolutely inflexible. It leaves no alternative whatever to the builder. It is more prohibitive than any scheme of protection ever devised or ever conceived for the United States, for builders in the United States may at least use foreign material if they will pay the duty on it. In Britain the ship builder can use nothing except articles of home manufacture, not even if he get equally as good at one-half the price elsewhere. And this applies not only to naval vessels but all ships that are intended for Admiralty subvention and mail contracts. Has the policy paid? Undoubtedly it has. Britain would not today have the preponderance of tonnage if it didn't pay. She may be a free trade country but she does not practice free trade in the vital matters of national defense and oversea prestige, in the extension of her mail facilities and the opening up of new avenues of trade. What an immeasurable advantage her devotion to her own industries has given her. Great Britain has, in fact, ever since the advent of steam navigation continuously protected her shipping. She has not lapsed in this jealous watchfulness for a single day. She began granting mail subsidies as soon as steam demonstrated the practicability of deliveries oversea upon a regular schedule. She opened her treasury wide to ships that were constructed with due regard to their availability as naval auxiliaries. She encouraged her ship yard and engine plants with steady orders as she is now encouraging British industry throughout the kingdom by reserving to British manufacture the entire equipment of her immense navy.

In the face of this how can anyone say that Great Britain does not aid her shipping? She is the bravest of

all the nations in her outspoken and public adherence to a fixed policy of protection for the ship. When the International Mercantile Marine Co. was formed, commonly known as the Morgan combine, to take over the White Star and other British lines, the British government promptly advanced $13,000,000 to the Cunard Line to construct the Lusitania and Mauretania and at the same time increased the mail and admiralty subvention to the Cunard Line in sufficient ratio to extinguish the loan in 20 years. It was a courageous and splendid thing to do.

The gist of the whole subject is, as the *Steamship* says, that the engineering and ship building industry as a whole must necessarily derive considerable advantage from this system of admiralty protection by reason especially of the security it gives to manufacturers for the employment of a definite amount of skilled labor, plant and machinery. It makes possible the existence of plants capable of turning out a battleship complete in nine months, and by the same token, of merchant ships at a fair cost per ton. The merchant marine is as much benefited by this plan of admiralty protection as the navy itself. In fact the ship owner, the ship builder and the manufacturer are alike benefited—the ship owner in low cost, the ship builder in steady work, and the manufacturer in an assured market for his product.

It is one of the stock arguments of the opponents of aid to American shipping that the British tramp is not subsidized. With trade routes projected at government expense, kept open at government expense and with the lines of defense so admirably supported at every point the tramp needs no further aid. It has already had the aid of first cost through the generous policy of its government and it finds its market awaiting it in all quarters of the globe through an equally wise and far seeing administration. Grant the American tramp the same conditions through governmental policy and see what happens.

RECIPROCAL TONNAGE TAX REPEALED.

The tariff bill as finally passed by the house on July 31 repeals the so-called reciprocal tonnage tax exemption law of 1886. Vessels entering from the Netherlands, Copenhagen and Dutch East Indies 60 days after the bill is signed will pay 6 cents per ton as from other European and Asiatic ports. Vessels from Ontario, Colon and Panama, and a few lesser West India islands will hereafter pay 2 cents. The general rate on vessels from Quebec, British Columbia, Nova Scotia, New Brunswick, Newfoundland, Mexico, Central America, Cuba and the West Indies will be reduced from 3 cents to 2 cents, or 10 cents instead of 15 cents a year. The passage of the section forestalls a possible loss of $325,000 in our revenue through the repeal of British light dues and a demand for reciprocal exemption in the United States of ships from the United Kingdom. It, of course, abolishes the reciprocal relationship hitherto existing between United States and Canadian vessels on the great lakes in trade between United States and Canadian ports. Lake vessel owners engaged in this trade will pay about $20,000 per annum in dues from which they were formerly exempt. The provisions of the act are as follows:

Sec. 36. That a tonnage duty of 2 cents per ton, not to exceed in the aggregate 10 cents per ton in any one year, is hereby imposed at each entry on all vessels which shall be entered in any port of the United States from any foreign port or place in North America, Central America, the West Indies Islands, the Bahama Islands, the Bermuda Islands, or Newfoundland, and a duty of 6 cents per ton, not to exceed 30 cents per ton per annum, is hereby imposed at each entry on all vessels which shall be entered in any port of the United States from any other foreign port, not, however, to include vessels in distress or not engaged in trade.

This section shall not be construed to amend or repeal Sec. 2792 of the Revised Statutes amended by Sec. 1 of Chapter 212 of the Laws of 1908, approved May 28, 1908, or Sec. 5 of the said Chapter 212 of the Laws of 1908, or Sec. 2793 of the Revised Statutes.

Sec. 4232 of the Revised Statutes, and Secs. 11 and 12 of Chapter 421 of the Laws of 1886, approved June 19, 1886, and so much of Sec. 4219 of the Revised Statutes as conflicts with this section, are hereby repealed.

This section shall take effect 60 days after the approval of this act.

COASTWISE TRADE PRIVILEGE EXTENDED.

Section 19 of the new tariff bill extends from two months to six months the period in which American vessels, built of imported materials free of duty, may engage in the coastwise trade. It reads:

Sec. 19. That all materials of foreign production which may be necessary for the construction of vessels built in hte United States for foreign account and ownership, or for the purpose of being employed in the foreign trade, including the trade between the Atlantic and Pacific ports of the United States, and all such materials necessary for the building of their machinery, and all articles necessary for their outfit and equipment, may be imported in bond under such regulations as the secretary of the treasury may prescribe; and upon proof that such materials have been used for such purpose no duties shall be paid thereon. But vessels receiving the benefit of this section shall not be allowed to engage in the coastwise trade of the United States more than six months in any one year except upon the payment to the United States of the duties of which a rebate is herein allowed: *Provided*, That vessels built in the United States for foreign account and ownership shall not be allowed to engage in the coastwise trade of the United States.

TRIALS OF THE SCOUT CRUISERS.

The bureau of steam engineering, navy department, announce in reply to a request from THE MARINE REVIEW for an authoritative statement regarding the recent performances of the scout cruisers Birmingham, Chester and Salem on their voyage westward from the Canaries, that the run referred to was not a part of the official comparative tests, and that no official information will be given out until after the completion of the tests of the Salem, and until the board appointed to report on those tests has completed the examination of the data and made report in the matter. Therefore, any reports, printed or otherwise, on this subject are without the authority of the department.

STATEMENT BY THE FORE RIVER SHIP BUILDING CO.

EDITOR MARINE REVIEW:—The Fore River Ship Building Co. contracted with the Southern Pacific Co. for the building of the steamer Creole strictly on the owner's plans and specifications for the hull, and agreed to install twin screw Curtis marine turbines and Babcock & Wilcox watertube boilers. The shipbuilding company guaranteed that the vessel, under such arrangements as should be agreed upon between the parties to be proper, should show a speed of 16 knots on the round trip between New York and New Orleans in ordinary weather on 10,000 tons displacement and with a coal consumption not exceeding seven tons per hour. The contract also provided that if the turbines and boilers did not prove entirely satisfactory to the Southern Pacific Co., and they decided to install reciprocating engines and Scotch boilers,

the shipbuilding company would, if requested within six months after delivery of the ship, stiffen up the hull as might be necessary for this purpose. Before the delivery of the Creole in December, 1907, the ship builders installed a fourth set of screw propellers and made several trials of the vessel both light and loaded. The load-draught trial, run for a period of 24 hours in heavy weather, showed that the vessel was able to meet the contract conditions, the speed and coal consumption having been measured and certified to by independent outside experts. On the measured mile at Provincetown the vessel showed 17.23 knots light as a mean of high runs and 16.57 loaded. A speed through the water of about 15¼ knots is sufficient to show 16 knots average round trip from New York to New Orleans. After this time the vessel made 14 round trips to New Orleans, but failed on any trip to show the contract speed. The management of the Southern Pacific Co. always refusing to provide a fireroom force satisfactory to the shipbuilding company, or in numbers and efficiency adequate for the type of boilers, met with continual and increasing difficulties in the operation of the watertube boilers. These boilers on the builder's trials were shown to have fulfilled the efficiency guaranteed and were built by manufacturers whose experience in land and marine boilers is unexcelled.

Although difficulties were encountered in obtaining efficient screw propellers for the Creole the ship builders continued to give this matter attention and had secured satisfactory screws. The turbines were shown on trial and in service to have obtained the designed efficiency and economy and to be successful in mechanical operation, notwithstanding the severe treatment which they received from excessive boiler priming brought about by inexperience and carelessness in the fireroom. Notwithstanding the fact that the ship building company installed assisted fireroom draft on the Creole and carefully overhauled all auxiliaries on the vessel subjected to unusual deterioration from the use of salt and muddy water in the boilers and excessive priming from careless water tending, the boiler difficulties continued to increase until the vessel was laid up by the Southern Pacific Co. with the boilers in such condition that it was not safe to continue operation without careful overhauling.

The Southern Pacific Co. has demanded of the ship building company that they should remove the Curtis turbines and Babcock & Wilcox watertube boilers from the Creole and install at their own expense reciprocating engines and Scotch boilers. The ship building company, in declining to do this, maintains that the turbines, boilers and engine room auxiliaries are exactly as was contracted for and are capable under proper and intelligent operation, of fulfilling the contract conditions. Considering the conditions of operation by the Southern Pacific Co., and particularly the scale of compensation of mechanical staff adopted by the company, it is probable that the operation of watertube boilers is not suitable, although they were recommended by and acceptable to the company's management at the time the contract was made. If the ship builders had sacrificed the greater turbine efficiency, due to the higher pressure and drier steam of the watertube boilers, and installed Scotch boilers originally, they are confident that the turbine equipment would have given satisfaction, and that the difficulties experienced are due to the conditions of operation of the watertube boilers, the turbines having stood punishment which no reciprocating engine could have passed through.

FORE RIVER SHIP BUILDING CO.,
H. Brown, Asst. Mgr.
Quincy, Mass., July 19.

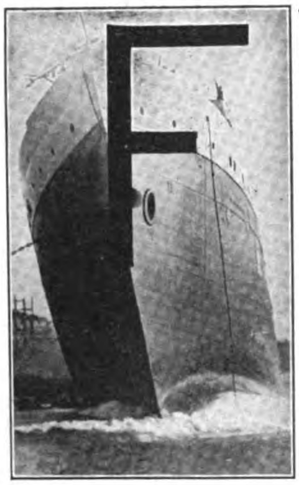
RETIREMENT OF MR. H. J. CORNISH.

After a long and honorable connection, extending over 46 years, with Lloyds Register of Shipping, Mr. Harry J. Cornish, chief ship surveyor to that society, is about to retire from his important position. During this prolonged period Mr. Cornish has rendered much valuable service both to the society, and through it, to the shipping community at large. He comes from a sea-faring stock, for his grandfather fought on Nelson's ship at the Battle of the Nile. Born at Davenport in 1839, Mr. Cornish was privately educated and afterwards gained valuable experience of a ship surveyor's duties in Deptford Green Dockyard, where he continued until 1863, when he was appointed a surveyor to Lloyds Register. For many years he was associated with the late Mr. Bernard Waymouth (at one time chief surveyor and afterwards secretary to Lloyds Register), and in 1867, when the society's rules for composite ships were formulated, the illustrations of the text drawn by Mr. Cornish were selected from those submitted by other surveyors as being of exceptional merit, and besides being accepted by the committee, were subsequently shown at the International Exhibitions of Paris and Moscow, where they were awarded bronze and gold medals, and are now in the South Kensington Museum. In 1870 Mr. Cornish was given the post of assistant chief surveyor, under the late Mr. Benjamin Martell, and after serving 30 years in that capacity, he was appointed chief ship surveyor on Mr. Martell's retirement in 1900. Mr. Cornish's earliest practical experiences embraced the completion and preparation for sea of the S. S. Great Eastern in 1858, whilst but a year or two ago he was in constant consultation with the owners and builders regarding the designs of those great Atlantic greyhounds, the Cunard Liners Lusitania and Mauretania, both of which are classed with Lloyds Register. Throughout the whole of his connection with the society Mr. Cornish has been intimately concerned in those developments in the rules which experience and the gradual evolution of the merchant vessel have shown to be necessary, and the close of his official career has been made conspicuous by the committee's adoption of the revised rules for steel ships which he and his colleagues at the Registry have been long and carefully preparing.

Mr. S. J. P. Thearle has been appointed by the committee to be the new chief ship surveyor to the society, he having been, since 1900, the principal assistant to Mr. Cornish. Mr. Thearle's connection with the society also extends over a long period. He was appointed a surveyor in 1876 and the greater part of his official career has been passed on the Clyde, and subsequently he filled the appointment of principal surveyor to the society at Newcastle-on-Tyne. In 1893 the committee selected him to accompany Mr. Cornish to the Great Lakes of North America, for the purpose of conducting investigations into the shipbuilding industry in that district, and reporting thereon for the committee's information. Mr. Thearle is the author of several well-known works dealing with the science of naval architecture, his book, in 2 volumes, entitled "Modern Practice of Shipbuilding in Iron and Steel," which has run into many editions, being regarded as a text-book by the Board of Trade. He is a member of council of the Institute of Naval Architects and is fully qualified in every way to occupy the high and responsible position which Mr. Cornish is relinquishing.

Light vessel No. 81 has been ordered to the Union Marine Works plant at New Orleans, La., for general repairs.

The Northern Navigation Co.'s S. S. Hamonic.



FOR several years past the Canadian lake marine has had a healthy growth. The shipbuilders of Canada, and the Collingwood Shipbuilding Co. in particular, have just cause for pride in this latest addition to the passenger fleet of the Great Lakes, and to them the builders on the American side of the line offer their hearty congratulations. Certainly we have produced nothing finer.

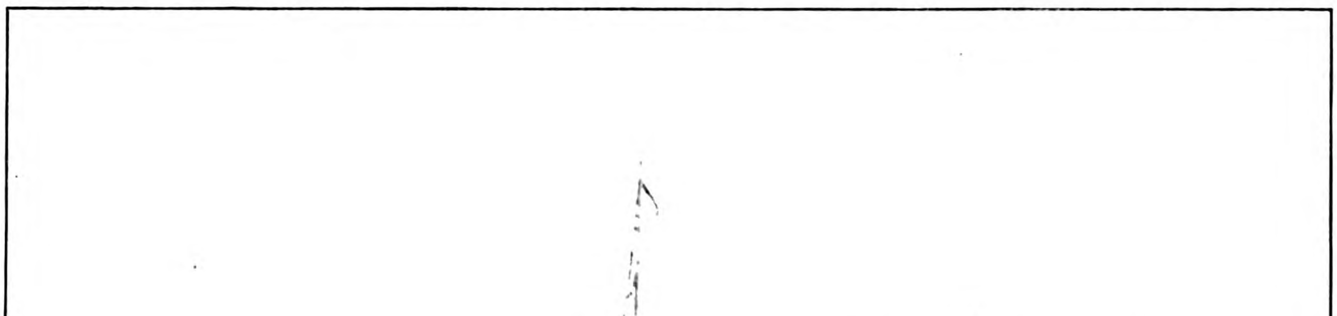
The Hamonic is of the same class as the Tionesta and Juniata of the Anchor Line in that she is designed for the combined passenger and freight trade, though somewhat larger and faster and differing somewhat in general arrangement.

The ship is built on the channel system and is 365 ft. long, 50 ft. beam, and 27 ft. deep, molded, to spar deck, with a gross tonnage of 5,240. The midship sections show clearly her hull construction.

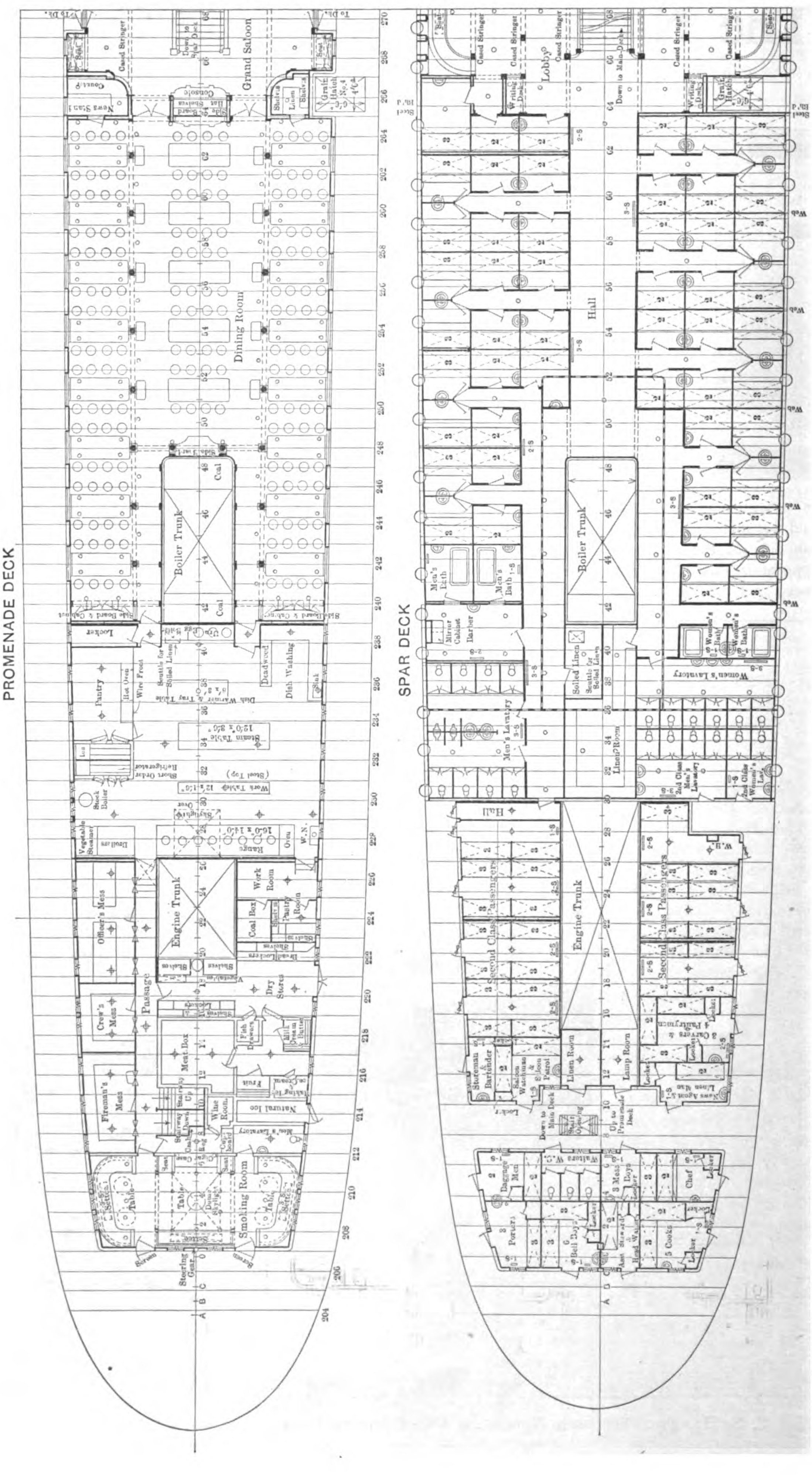
There are eight hatches in main deck, six forward of passenger gangway and lobby, which extends clear across the ship, and two aft. There are five cargo holds separated by bulkheads, up to main deck of which three are watertight, in addition to the usual watertight bulkheads at peak and coal bunker.

The ship is entered by five 7-ft. gangways with the usual double doors as now fitted to package freighters, in addition to the passenger and engine room gangways. A full equipment of cargo hoisting gear of the standard line shaft and double friction drum type, serving all hatches, is fitted.

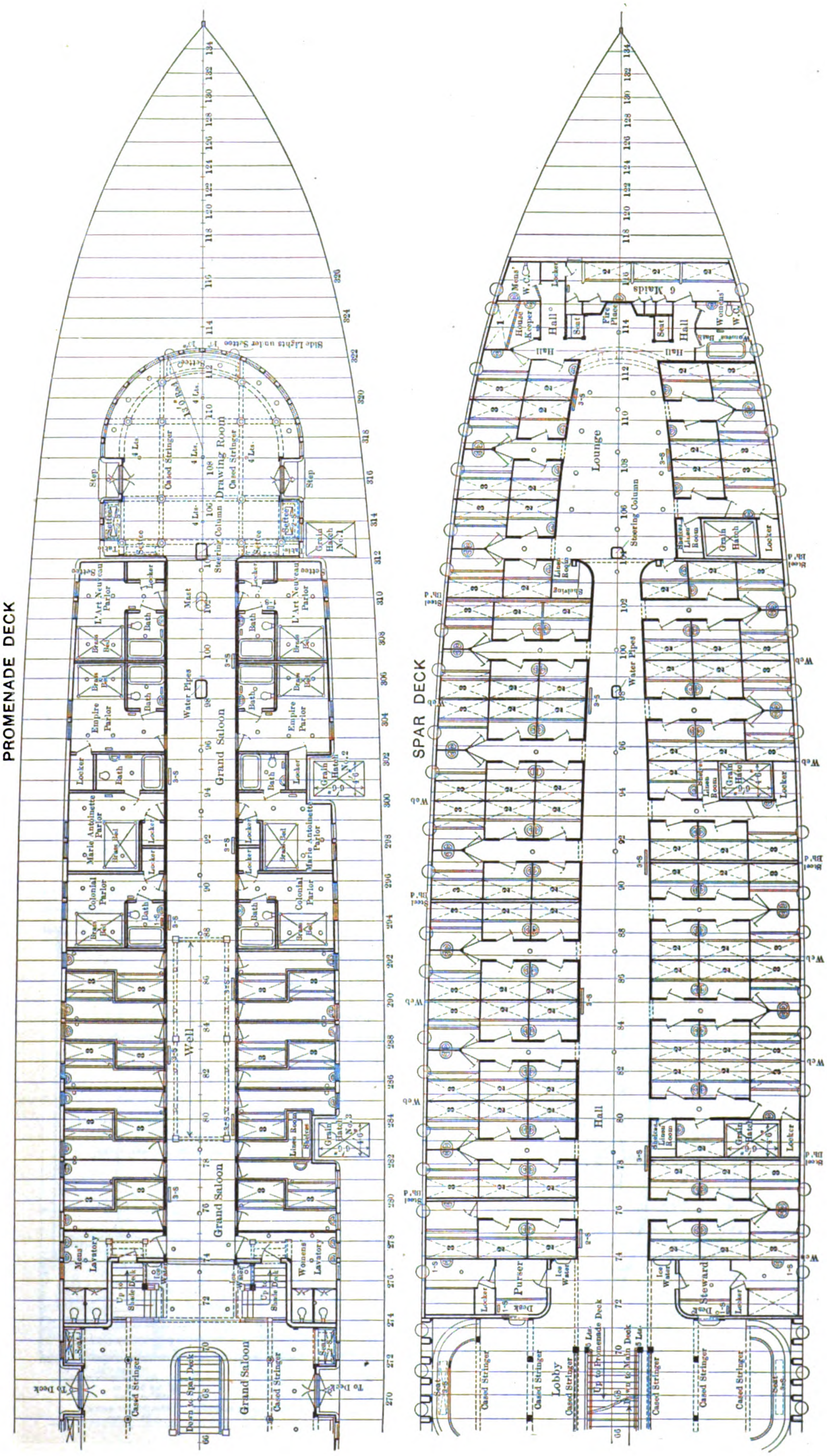
The propelling machinery consists of a quadruple engine with cylinders 24-35-52 and 80 in. dameter, 42 in. stroke, driving a single screw, 16 ft. 6 in. diameter, 18 ft. 6 in. pitch, with 84 sq. ft. projected and 98 sq. ft. developed, area. Steam is furnished at 250 lbs. working pressure by six boilers 12 ft. 6 in. diameter, 11 ft. long. Each boiler contains two 44-in. furnaces and 260 3-in. tubes. The boilers are fitted with positive heated draft. The aggregate grate area is 243 sq. ft. and the heating surface 11,070 sq. ft. The boilers are set



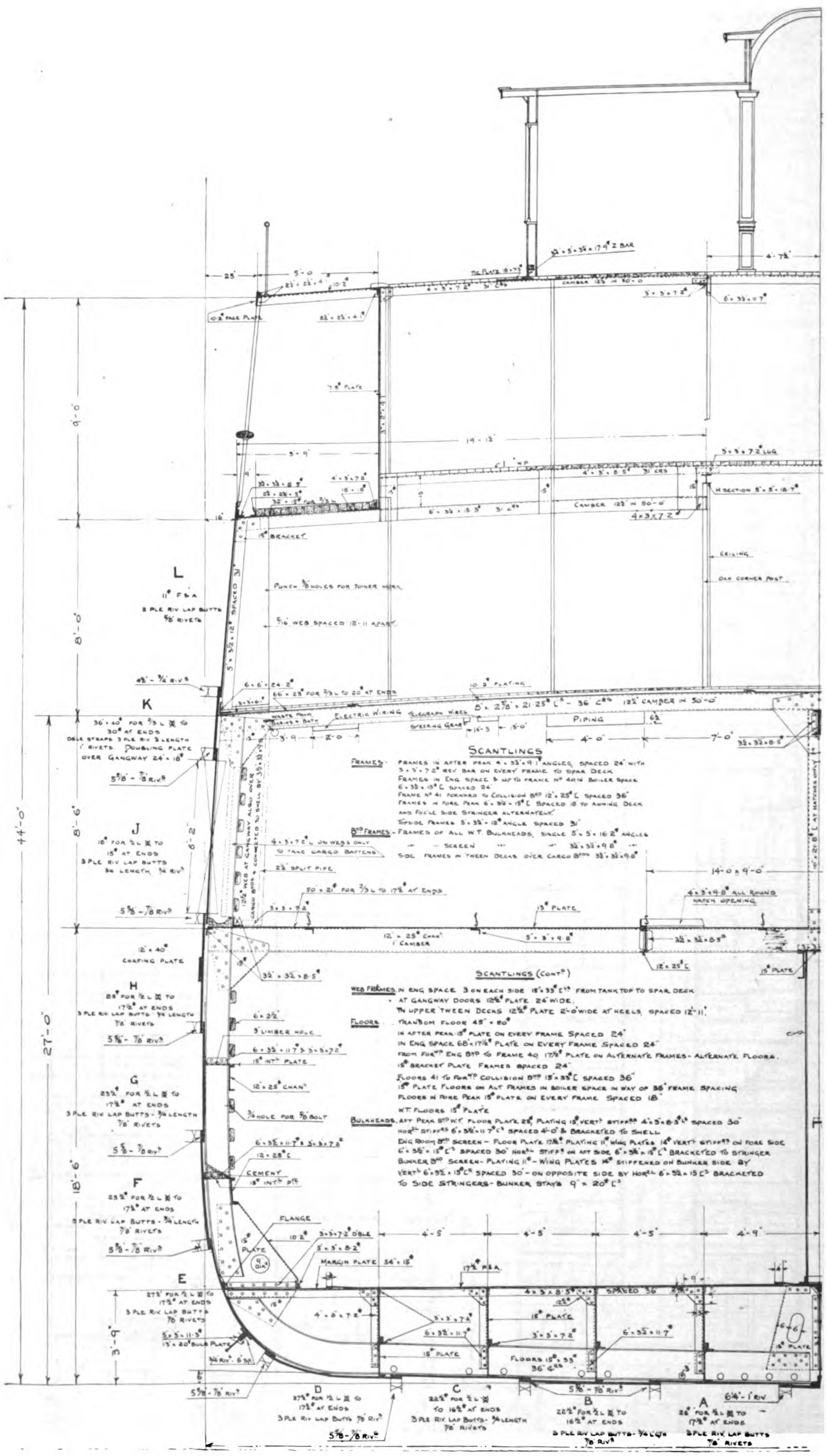
S. S. HAMONIC, NORTHERN NAVIGATION CO. BUILT BY COLLINGWOOD SHIPBUILDING



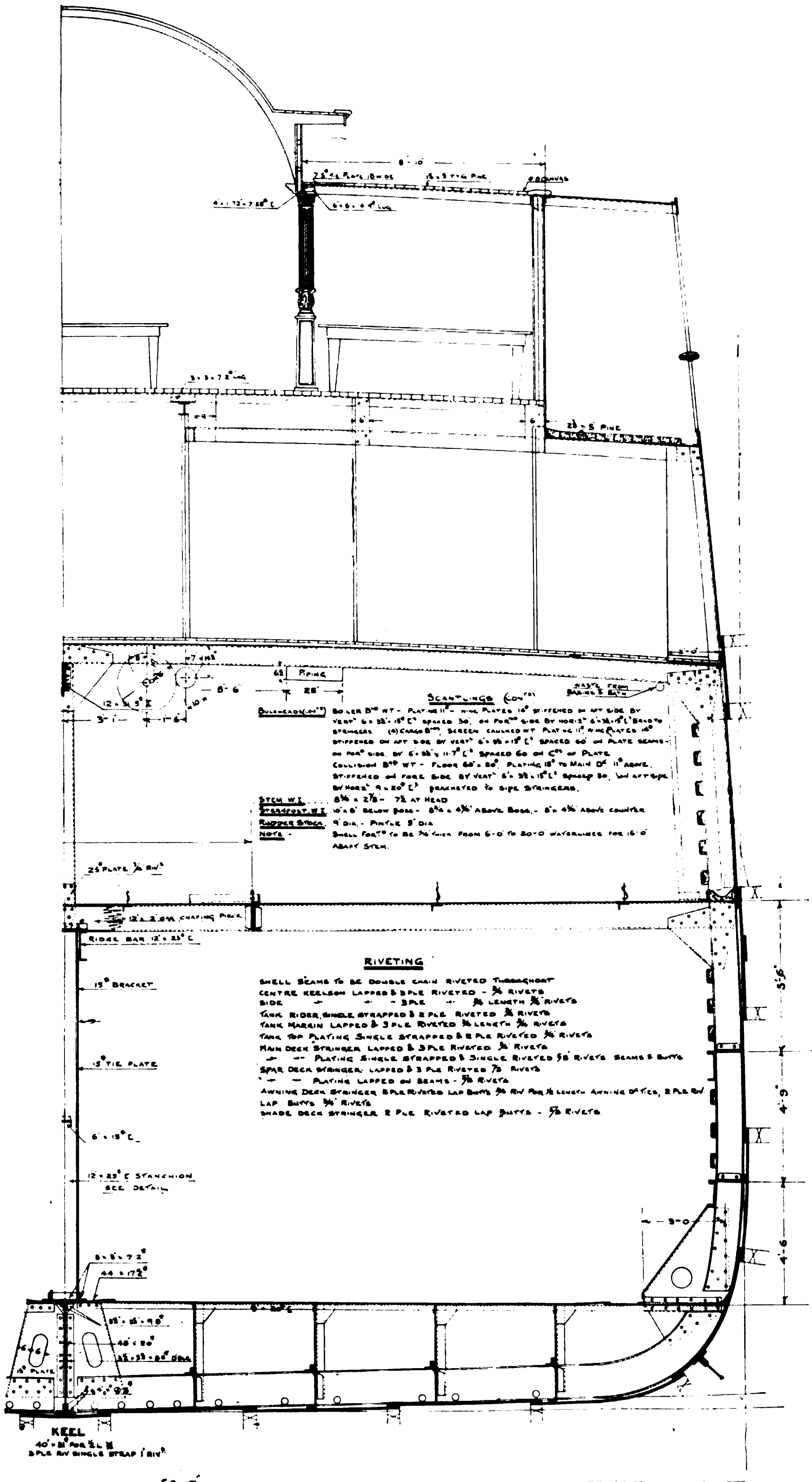
Cabin Plans Aft, S. S. Hamonic.



CABIN PLANS FORWARD, S. S. HAMONIC.



HALF MIDSHIP SECTION, S. S. HAMONIC.



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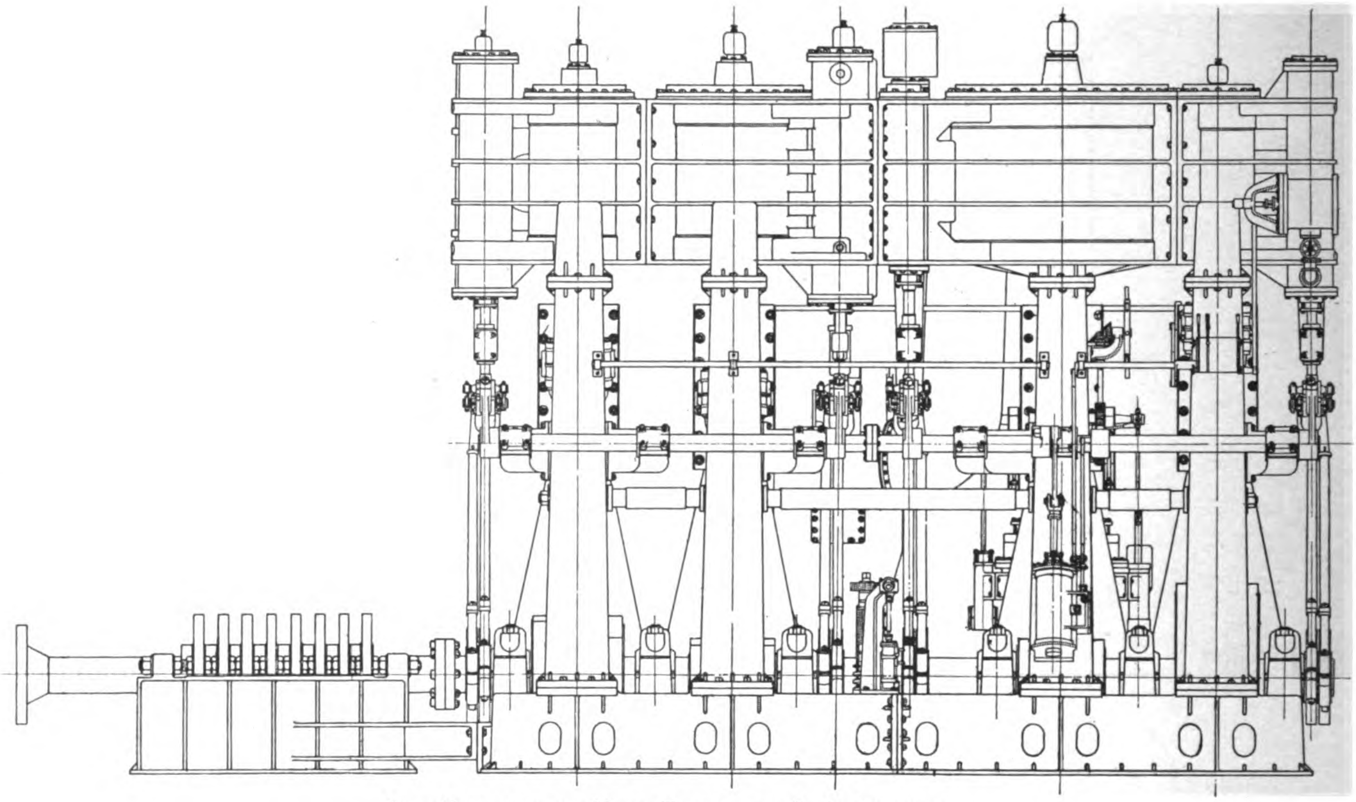


SIDE ELEVATION OF MAIN ENGINES OF S. S. HAMONIC.

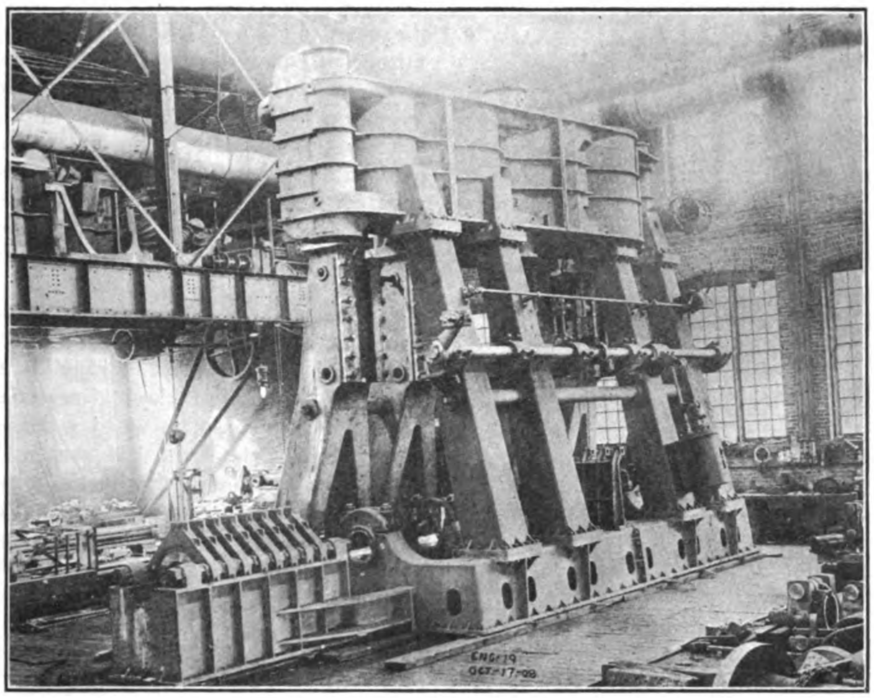
athwartship with fore and aft fire hold and a cross bunker forward and aft. The engines are a very handsome job and rather better finished than has become the custom in recent years. The auxiliary equipment is most complete. In addition to the stokehold ventilation provided by the fan for the draft system, which draws from the stokehold, the air being supplied by large down-comers in the stack casing giving a cool, comfortable fire room, there are two large fans provided specially for fire-hold ventilation at times when the draft system is not in operation, as in port. The draft fan can also draw from the engine room when desired. The usual ballast, bilge, feed and fresh water pumps are fitted; the electric lighting system is in duplicate and a 5-ton refrigerating plant is also installed.

In light trim, with a draft of 18 ft. 5 in. aft and 5 ft. forward the displacement is 3,850 tons and the speed with 4,700 I. H. P., 17 knots, or 19.6 statute miles per hour. The displacement at 18 ft. mean draft is 6,500 tons, with a block co-efficient of 0.633, which, it will be seen, gives very fine, easy lines. The corresponding speed is about 18 miles.

The first-class cabin accommodations include eight parlor state rooms, each with private bathroom, and 157 state rooms, of which 67 are three-passenger and 91 two-passenger rooms. Rating the parlor rooms as two-passenger, the total accommodation is therefore equal to 400 first-class passengers. The second-class accommodations provide for 75 passengers. The general arrangement of the cabins is clearly shown on deck plans.

The parlors are finished in four different styles and the general finish throughout the saloons, drawing rooms, smoking rooms, etc., is of a high order and the decorations in particular are in excellent taste. The tendency towards an excess of gilding and mirror plate which has come to us from some of the Atlantic lines,

END ELEVATION OF ENGINES, S. S. HAMONIC.



ENGINES OF THE S. S. HAMONIC IN THE SHOP.

more particularly the German, is conspicuous by its almost total suppression, and its place is supplied by a discriminating taste in choice woods, in quiet but excellent finish, which will be satisfying long after the more brilliant styles have become wearisome and grown shabby.

Running water is supplied in all staterooms and lavatories and the inside rooms are well ventilated.

The dining saloon is especially pleasant. Each of the side tables abuts against a large plate glass window 4 ft. 6 in. wide, so that every passenger has a practically unobstructed view to both sides of the ship, giving almost an outdoor effect. There is seating capacity for 168 at one time, and the spacing of the chairs is noticeably liberal, eliminating one of the most common discomforts of steamship travel.

Another feature, too, which will appeal to the experienced traveler is the entire absence of athwartship sittings; every diner faces forward or aft, and the discomfort and incoveniеnce which even the most moderate movement of the ship causes ordinarily is practically done away with.

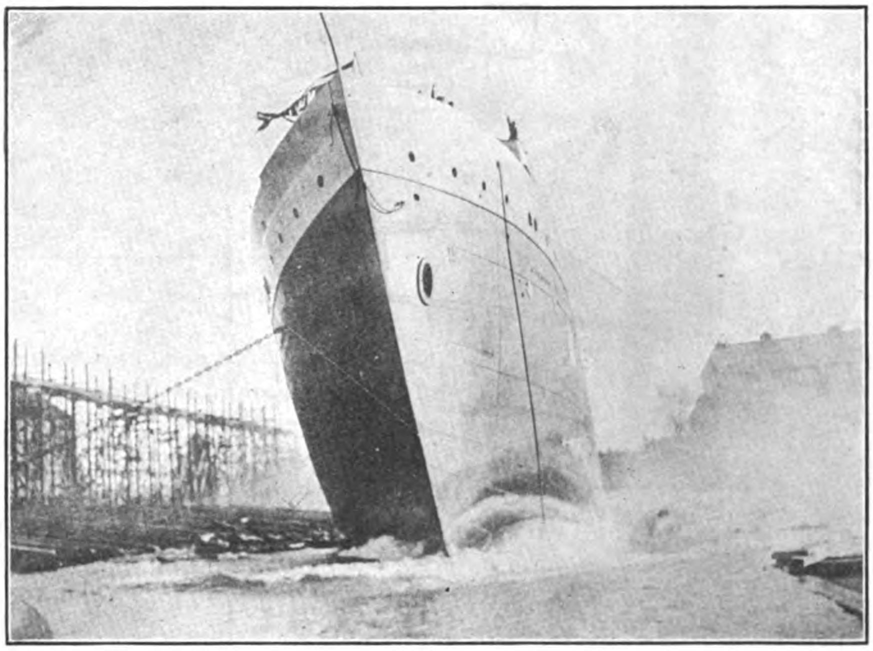
The observation and music room on the shade deck, not shown on plans, will doubtless prove most popular. It is a splendid room, 72 ft. long, 24 ft. wide, with plate glass in 4 ft. 6 in. sash, all fore and aft, and finished, including the piano, in Flemish oak. With its light rattan furniture, in liberal supply and restful forms, and an almost complete horizon, it is a most satisfying spot. Large double doors give egress to the shade deck over which awnings are provided. The boats and rafts are also carried on this deck.

The Northern Navigation Co., the owners of the Hamonic, have ample reason for their pride in this addition to their fleet. They have issued a very neatly gotten up little booklet entitled "The Building of a Ship," in which the story of the building of the Hamonic is told in a series of pictures, from the receipt of the material in the yard to the finished vessel.

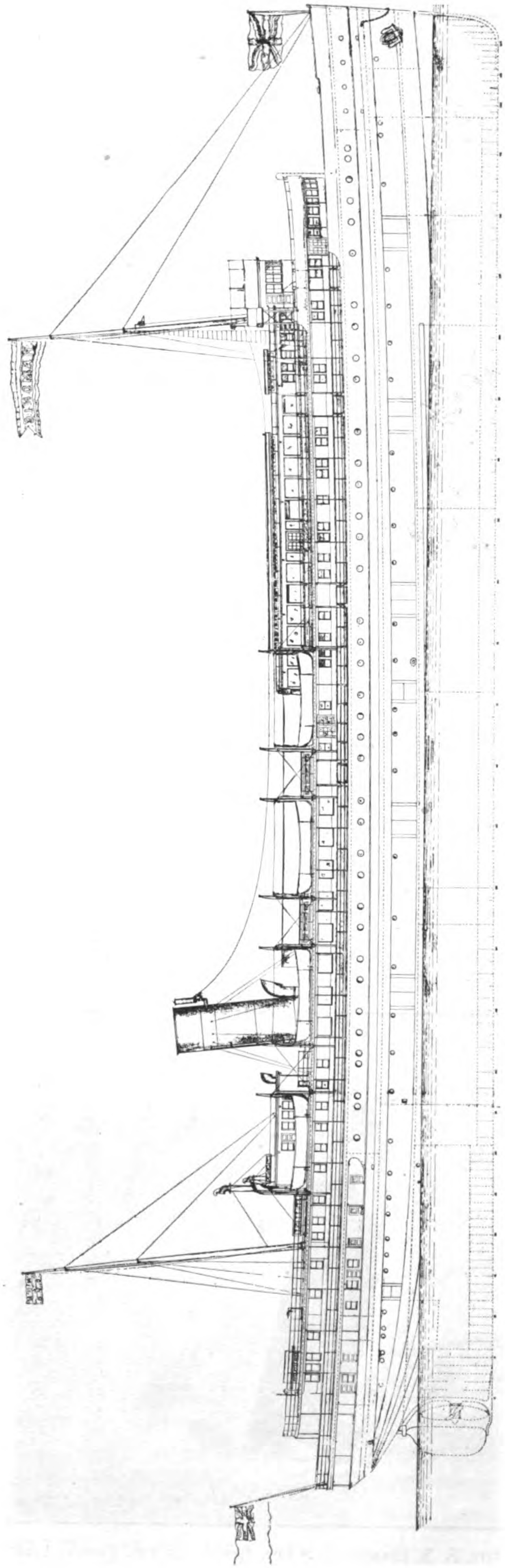
H. H. Gildersleeve and James M. Smith, managers of the Northern Navigation Co. and of the Collingwood Shipbuilding Co., respectively, have between them produced a ship which is the equal, for her capacity and trade, of any ship afloat, on either fresh or salt water.

MERSEY NEW SHIP BUILDING YARD THE FINEST IN THE WORLD.

Messrs. Cammell, Laird & Co.'s new ship building and engineering establishment at Tranmere Bay, on the opposite side of the river Mersey to Liverpool, is probably the finest place of its kind in the world. Including the old works of Cammell, Laird & Co., adjoining, the whole business now covers an area of 105 acres, 80 of which are devoted to what is familiarly known as the extension. There are graving docks in the old work—five of them in fact, but none are of greater length than 440 ft. In the new ship yard there are two graving docks, one of which is 708 ft. long by 80 ft. broad, with a depth of water on the sill at ordinary spring tides of 31 ft., and the other 850 ft. long by 90 ft. broad, with a depth on the sill at ordinary spring tides of 34 ft. In addition there is a fitting-out basin with a water area of 14½ acres, and about 3,000 ft. of dockage, the entrance to which is 91 ft. 6 in. broad, and a depth on the sill at ordinary spring tides of 34 ft. The larger of these dry docks could take in either a Dreadnaught or a Lusitania. The entrance to the wet dock is also generously ample. No dock entrance on the Thames comes within 11½ ft. of its width. The machinery equipment



LAUNCH OF THE S. S. HAMONIC. (THE EFFECT OF THE DRAGS, UNUSUAL IN LAKE LAUNCHINGS, IS PLAINLY PERCEPTIBLE.)



OUTBOARD PROFILE OF STEAMER HAMONIC OF NORTHERN NAVIGATION CO.'S FLEET.

of docks, yards and workshops is of the most modern description. On one fitting-out quay there is a 150-ton crane, tested up to 200 tons, and on another a 40-ton crane. South of the wet dock the building slips to accommodate eight large Atlantic liners are situated, and here ships over 1,000 ft. in length can be laid down. Behind the slips have been erected an iron foundry, pattern shops, joiners' shops and platers' sheds. The platers' sheds cover an area of 145,000 square yards, and their facilities for the rapid handling of the heaviest class of material are quite notable. The wood working departments have been laid out with great care, and equipped with the most modern machinery. In the vast engine shop alone there are machines and implements which have never been used by any other ship building firm in the country, the very latest inventions having been adopted both for producing the most delicate work and for the general overhead cranes driven by electricity which will lift the steamship parts to any position of the buildings. The steel plate rolling department will be a practical romance in modern engineering, for there will be nearly a hundred different machines driven by electricity, each manipulated by one man. The power throughout the extensive works is electrical and generated from Mond gas manufactured in the yard, a 4,000-H. P. plant having been erected. The electric power station is close to the gas generator, which requires to be worked by two men only. There is besides a complete installation of hydraulic and pneumatic power.

The new works at the present time are gradually being brought into use as new ship building orders are booked, but some considerable time must yet elapse before all the machinery and the exceptional facilities of this new ship building yard are in full operation.

The Southern Ship Building Co., of Tottenville, Staten Island, N. Y., is building a steamer for the Haverhill Steamship Co., of Gloucester, Mass., to be 170 ft. long, 32 ft. beam and 12½ ft. deep, to be propelled by a twin screw engine of 1,100 H. P. She will have a speed of 10 knots and is intended for the fish-carrying trade between Gloucester and New York. It is expected that with the completion of the Cape Cod canal it will be possible to develop a trade in fresh fish with New York.

Transmission of Intelligence on Steam Vessels.*

By H. A. Hornor, Electrical Engineer, New York Ship Building Co.

COMMUNICATION on steam vessels divides itself into signals for navigational protection from other craft and means whereby it may securely provide for its own safe carriage of human life and cargo; on the one hand exterior communication to ward off collision, as well as maintain its own legal course, on the other interior communication for the proper, lawful and safe manipulation of the vessel and the accommodation of her passengers, officers and crew. Exterior communications required by law are: Running and anchor lights, searchlights (in some instances), steam whistle, siren fog whistle, rockets, etc. Wireless telegraphy, submarine signals, night signal sets, electric flash lights for steam whistle, are carried on many vessels today as a greater factor of safety. The scope of this paper will not permit even a brief description of these systems, if indeed a brief description could be made, and attention will be addressed solely to the reasons for, and the present means of, interior communication on steam vessels.

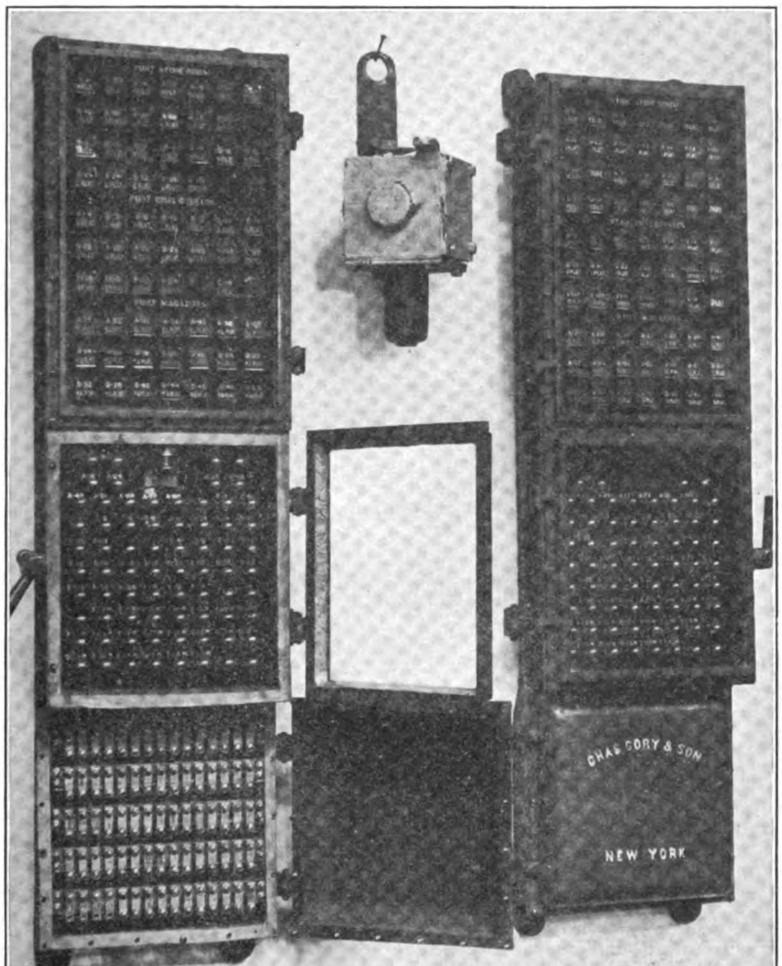


FIG. 1.—METALLIC THERMOSTAT AND THERMOSTAT ANNUNCIATORS.

It is generally known that steam vessels vary greatly in type. Therefore a standard steamship is but the immaterial mind-wanderings of the hopeful ship builder—he who would like to manufacture ships as they do screws, or pens. But it does not occur to many that, other than the varying types, the vessel usually is for some particular or special service. Thus one might fancy that a number of ships designed exactly alike in regard to form, line, propulsion, etc., and yet for a different service, must, to satisfy this service, be very differently equipped. So passenger and freight vessels for our coastwise shipping, though resembling trans-Atlantic Leviathans, employ docking telegraphs because they can more economically and time-sparingly enter their docks. The trans-Atlantic and trans-Pacific vessels, due to their size or due to the docking

FIG. 2.—ENGINE REVOLUTION TRANSMITTER. ELECTRIC LAMP TYPE.

*Paper read before the electrical section, Franklin Institute, Philadelphia. Reprinted from the Journal of the institute.

facilities, depend upon tug-boats for these maneuvers. Ferry-boats which are constantly coming in or going out of their slips are provided especially with direction tell-tales which assure the pilot that the engines are rotating in such manner that the boat will advance when he has signalled for ahead motion. Avoidance of serious mishap is thus accomplished. River excursion steamers, whose superstructures are built entirely of wood, thereby requiring great vigilance for the detection of misanthropic fires, are supplied with

FIG. 3.—ENGINE REVOLUTION TRANSMITTER. ELECTRIC LAMP TYPE WITH DIAL REMOVED.

a complete fire-alarm equipment, this system being so designed that hardly a square yard of the vessel is not guarded by such an appliance. For the assurance of the traveling public it may be well to note here that many of these vessels also carry a sprinkler system such as is now required in many of our land factories. Dredges which hold their working position by means of wooden poles (called spuds),

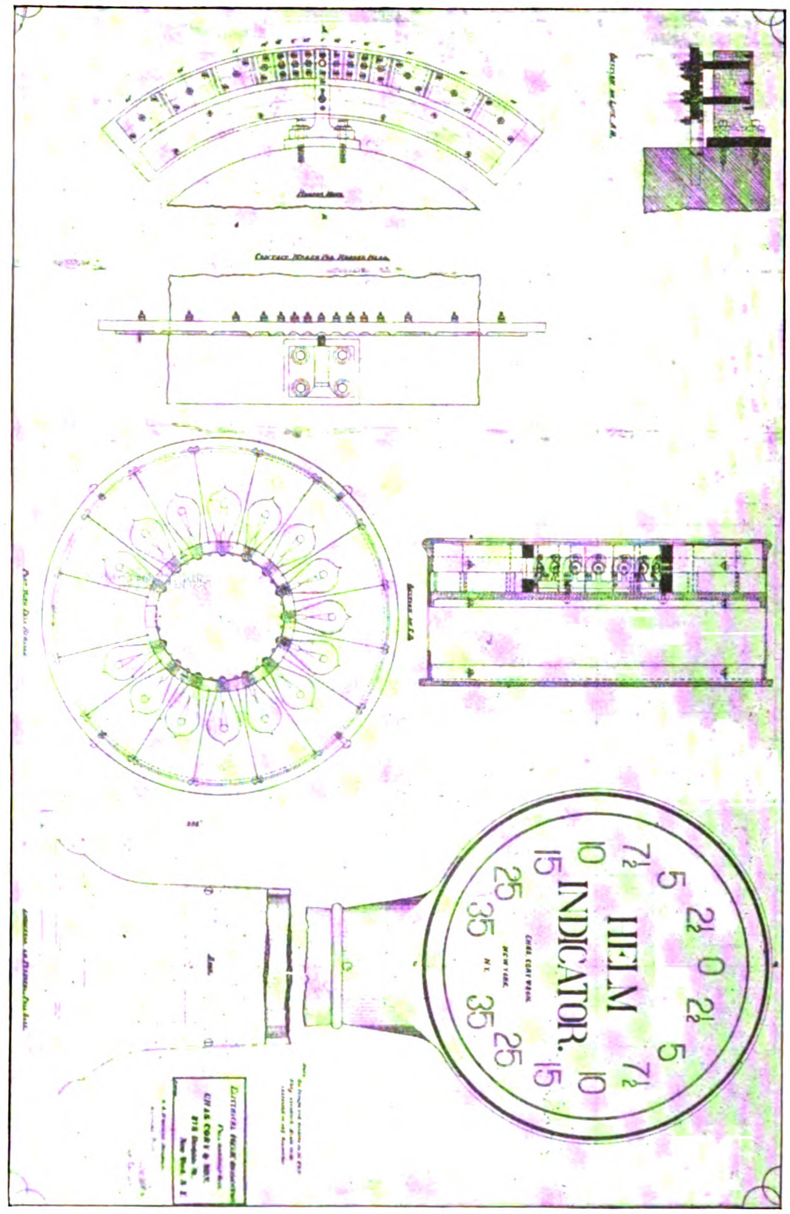


FIG. 4.—ELECTRIC HELM INDICATOR AND TRANSMITTER. LAMP TYPE.

which must be manipulated as their work progresses, require spud telegraphs which convey signals from the working platform to the men employed to raise or lower the spuds. So could be multiplied instances of differences in communication equipment for differences in service. Tempting as this subject is, the duty lies before us to describe the means of this communication and not its varying application.

Electricity holds an important place in the transmission of ships' signals, but this place is secondary as regards the movements of the vessels. Those signals which are necessary to navigation and maneuvering of the vessel are performed mechanically. The control of the main propelling engines from the bridge or pilot-house is accomplished by mechanical transmitters connected by bronze wire to receivers in the engine room. Wheels are encased in each instrument traversed by brass chains. To the ends of these chains the bronze wire is attached. Where corners are encountered triple linked brass chains are led over brass pulleys. In all cases reply signals are transmitted in order that no con-

FIG. 5.—ENGINE SHAFT SPEED INDICATOR.

fusion may arise. The cycle is thus:—Pilot house orders full speed ahead. Engine room replies by bringing arrow attached to handle to the same order. This latter is performed before the actual movement is given to the engine.

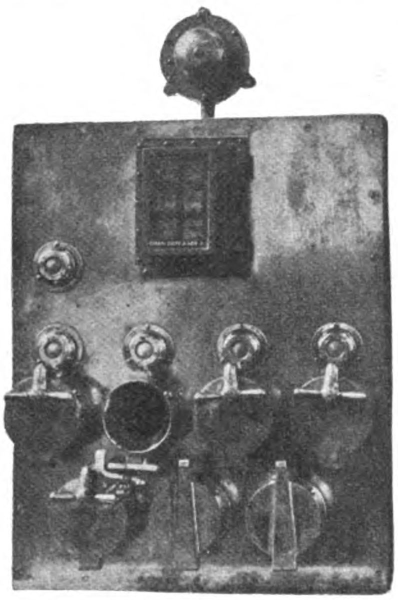


FIG. 6.—CALL-BELL AND VOICE-TUBE PANEL.

The markings on the dials are usually of the same character, namely: "stop," "stand by," "slow," "half speed," "full speed," "ahead," and the same "astern." The dials used on naval vessels differ a trifle, thus: "Stop," "slow," "half," "full" on back motion, "slow," "half," "standard," "full" on ahead motion. The dials of the transmitters for naval vessels, on account of gun shock, are made of a cast-brass frame work with the openings filled in with heavy transparent celluloid. Those for the merchant marine are fitted with white porcelain, the orders filled in with black enamel. They are illuminated by electric or oil lamps of small candle power. The receivers in the engine room are entirely of brass with the orders deeply cut in and filled for the "ahead" and "stop" divisions with black enamel and on the "astern" divisions red. The dials of standard transmitters are 12 inches in diameter and receivers about 16 inches in diameter. Smaller sized machines are recommended only for small craft, such as have pilot-houses too small to accommodate the standard sizes.

These instruments naturally superseded the ordinary brass gong and jingle bell in so much as they were the more readily operated and provided a great reliability. Today steamship rules require and naval vessels carry gongs and jingle bells as auxiliaries to the mechanical telegraphs in case of derangement of the latter. They are also required by law to have a "tube of proper size so arranged as to return the sound of the gong to the pilot-house." This practice is justified by experience. The detail, as will be clearly recognized, is truly serious; for not only is human life endangered, but incalculable damage will result if these signals are not correctly transmitted when docking the vessel.

Working upon the same principles as described above and resembling in outward appearance the engine telegraphs there are installed on merchant vessels docking, steering, helm and engine direction telegraphs. Docking and steering telegraphs are usually combined in one instrument. Two handles are employed, one on the right hand and one on the left hand of the head, the dial on one side giving the steering orders in degrees of the helm and on the other side the requisite orders for docking. The two instruments, one located on the navigating bridge and the other aft near the hand-steering wheel, are identical. They are not arranged for reply but can transmit signals in either direction. The orders for docking are interesting to a land-lubber because of

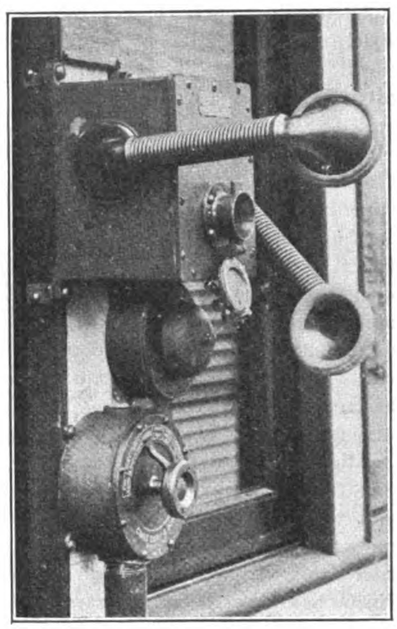


FIG. 7.—WATER-TIGHT TYPE "LOUD-SPEAKING" TELEPHONE.

their peculiar sailor characteristics, namely: "Stop engines," "slow ahead," "slow astern," "not clear," "all clear," "heave away," "slack away," "hold on," "let go," "make fast," "avast heaving," all expressions which, floating back in memory to the days of the wooden ship of small dimensions, were transmitted through the air by the sonorous voice of the captain, whose orders echoed back from the modern quartermaster. Today no sound is heard. The scene has lost its dramatic interest.

A band attached directly to the rudder stock indicates in the pilot-house or on the bridge the exact angle of the rudder. This is the helm indicator.

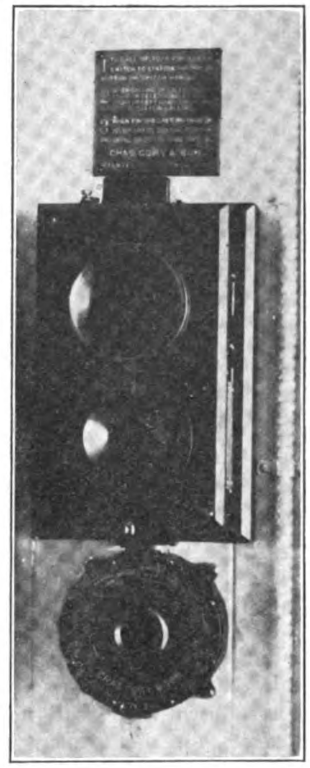


FIG. 8.—NON-WATER-TIGHT TYPE "LOUD-SPEAKING" TELEPHONE.

In like manner the engine direction indicator is connected to the reversing shaft of the main engine so that automatically the signal is transmitted when the engineer sets his engine for the given direction. Docking telegraphs are not in service on naval vessels at the present time, but steering telegraphs, helm indicators and engine direction indicators are customarily installed. Here electrical telegraphs take the place of the mechanical. They will be described subsequently more in detail.

Voice tubes of brass are required by law as auxiliary to the engine mechanical telegraphs. The law is usually fulfilled on merchant vessels by such communication between the pilot house bridge and engine room and also between the chief engineer's room and the engine room. On naval vessels the requirements far exceed this and will be treated later. The reliability of the voice tube between the engine room and bridge is altogether shattered by two elements which have not been overcome today, and which, as can plainly be seen, are almost beyond solution—the internal vibrations and noises of the propelling machinery and the wind whistling down the pipe from the ex-

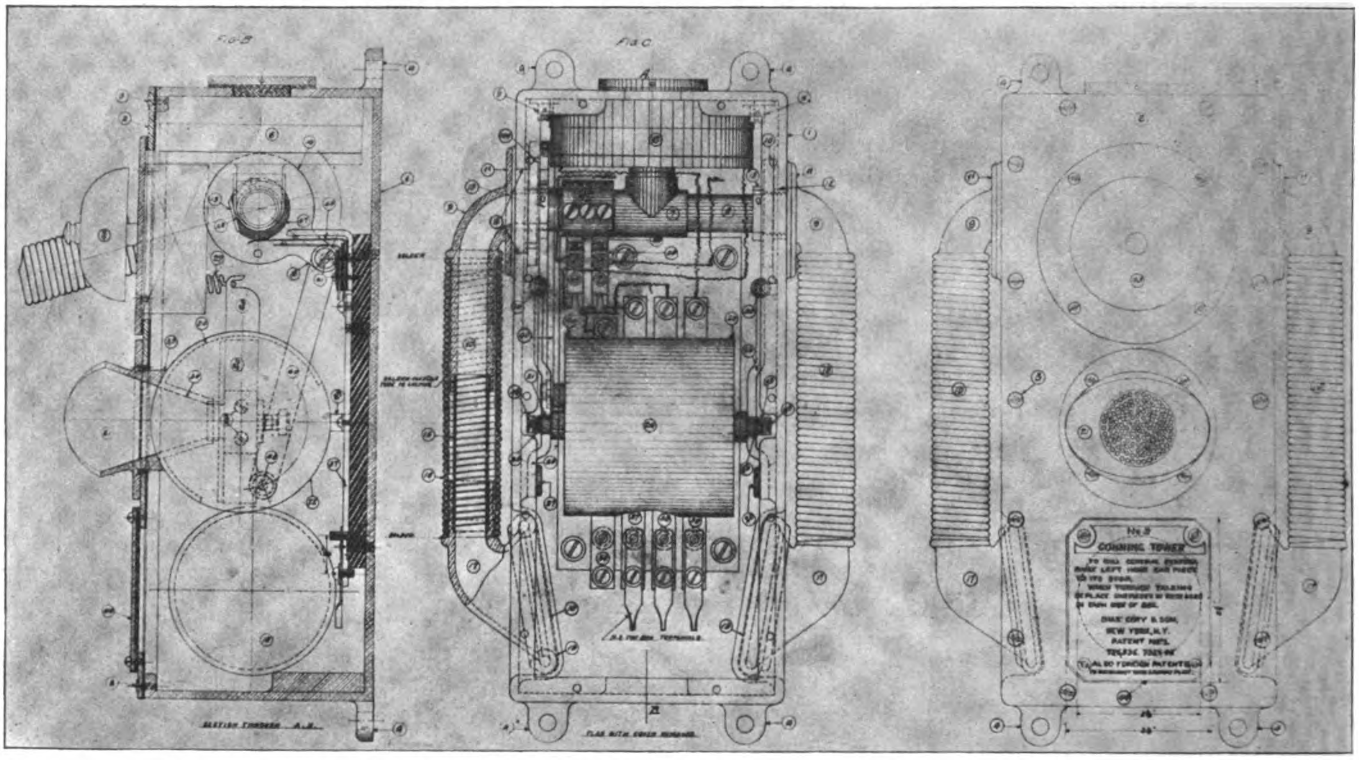


FIG. 9.—EXTERNAL AND INTERNAL VIEW, "LOUD-SPEAKING" TELEPHONE. WATER-TIGHT TYPE.

posed position of the tube on the bridge. For this latter cause swivel mouthpieces have been tried with no appreciable effect; for the former, insulated cushions where the tube attaches to hull have been employed with only greater detriment. Flexible rubber mouthpieces of 3 to 4 ft. in length are installed at certain termini for convenience and portability.

The steamboat inspection service makes the telephone a requirement on certain types of vessels. "On all steamers where the distance is more than 150 ft. between perpendiculars of pilot-house and forward part of engine room, there shall be communication by means of a telephone between the pilot-house and engine room, such telephone to be installed in lieu of a speaking tube." This condition will inevitably arise in vessels where the engines are located far astern or on vessels of unusual length. With the exception of this telephone circuit, all other telephone communication is optional and employed only for convenience. The development of the telephone for merchant vessels has not only been curtailed, but almost shattered by the falling off in construction of such vessels in this country. The memory must be strained to recall the last trans-Atlantic steamer of American construction, and coastwise steamers for passengers and freight are few and rare. A glance at American shipping for the last two years will readily convince. The shipyards of the country for this period have been sustained mainly by the government. An exact description, therefore, of the telephone installed on passenger and freight vessels must be at least vague. Later it will be seen that this important land instrument has been adopted in the United States navy and a steady development has succeeded. This development work, like many others, has an immediate and intimate effect on the merchant marine. Illustrating this the writer installed some two years ago on a coastwise passenger steamer eight intercommunicating telephones. These instruments were relied upon to the extent of omitting the mechanical docking and steering telegraphs. They also established convenient communication for the captain and chief engineer. At that time the navy was experimenting with what is known as the "loud-speaking" telephone (some authorities consider this a well-sounding phrase), which has now been superseded. This type of telephone was adopted for the case in hand. The system, as far as the telephones were concerned, was a common battery, three-wire circuit, other wires naturally being installed for the intercommunicating feature. The telephones for the exposed places and where the noises were excessive were entirely enclosed in water-tight brass boxes. To exclude external sound as far as possible double arm receivers made flexible for convenience extended from each side of the enclosing case. The non-water-tight telephones usually installed in the staterooms had all their parts directly attached and were self-contained. The delicate parts were also encased, but mounted in a hard-wood frame. A revolving lever brought the transmitter into circuit. These telephones would in nearly every case reproduce the human voice to such intensity that it would be audible some 6 or 7 ft. away from the instrument. In other large installations of telephones on shipboard recurrence to land practice usually prevails. Switch boards for ordinary land service are installed, and either batteries, or batteries and generators, included therewith. The problems involved will be better understood in viewing the development from a naval standpoint.

As a system of convenience, just as in land practice, the ordinary call-bell with push-buttons is without a rival. As an adjunct to the voice-tube system it maintains the dignity of its importance, although on many merchant vessels its place is filled by a whistle in the voice-tube mouthpiece. Annunciators resembling those found in offices and hotels are manufactured with a drop of such design that the rolling and vibrations of the vessel will in no way affect their proper and accurate operation. For above all things a system of convenience must, as such, work consistently. Despite all the wonders of electricity and all the development by all the mighty minds, if you press a button and there is no result therefrom, you not only become an atheist, but a positive pluperfect anarchist.

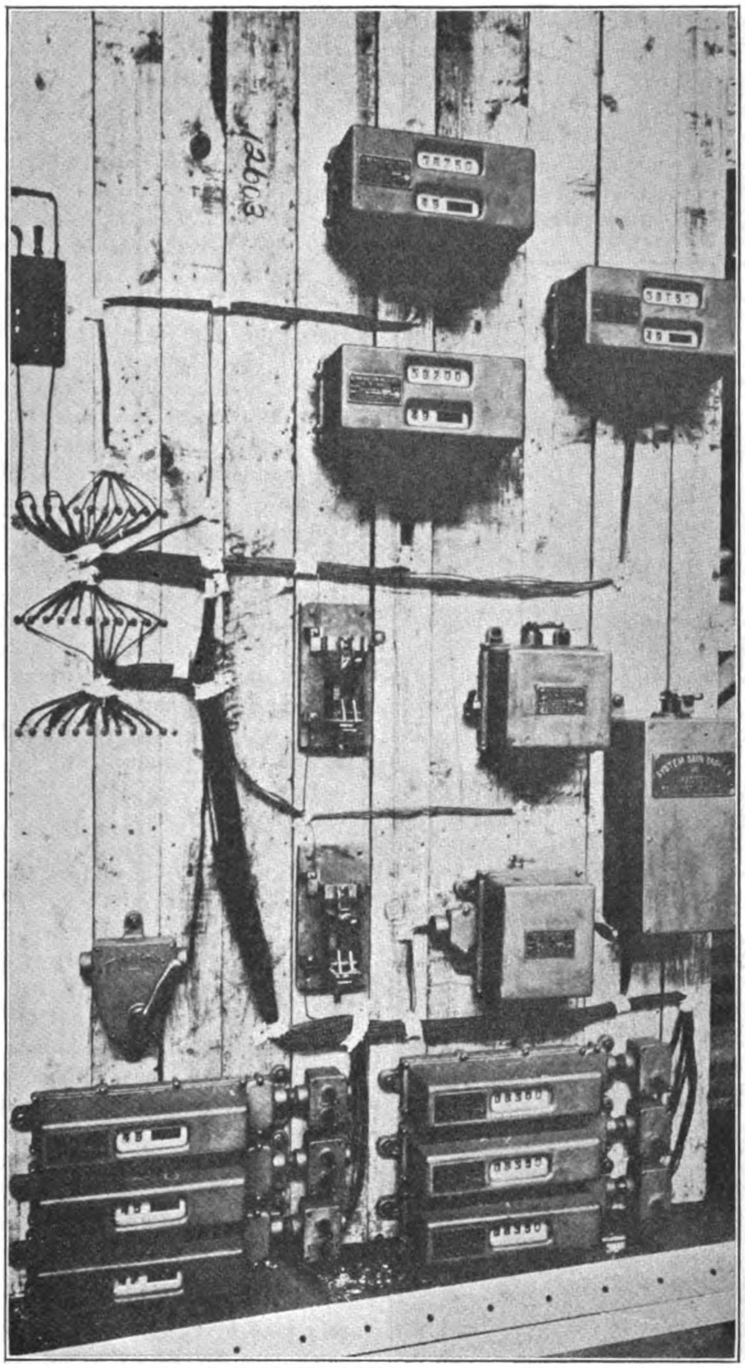


FIG. 10.—ASSEMBLY OF FIRE-CONTROL INSTRUMENTS.

With push-buttons made of water-tight pattern where exposed to the weather or rough usage, with innocuous ones in the better part of the ship and with well-designed annunciators, the call-bell system not only possesses an enviable and convenient position, but also is as indispensable to the comfort of the passengers and officers as the pleasant quarters or the agreeable cuisine.

The distinction between the mechanical instruments used on naval vessels and those employed on merchant ships has been punctuated. There are three systems of such communication that are not ordinarily fitted on the latter type of ships, but which are never omitted from battleships, namely, fire-room telegraphs, blower telegraphs, and turret-hoist telegraphs. The principles of their operation and methods of installation remain the same. Turret-hoist signals were only lately changed from electrical to mechanical, due to the sluggishness of the carbon filament incandescent lamps as compared to the increase in speed of the hoist, the latter lifting the charge from the handling room to the gun breech in five seconds. The signals are very simple, to wit: "Hoist," "Lower." The fire-room telegraphs control the management of the fire-rooms (or boiler-rooms). For the accomplishment of this purpose their dials are accordingly designed. They read as follows: "More feed," "All right," "Less feed," "Stop firing," "Priming," "Stop," "Slow," "Full speed," "Start auxiliary feed," "More steam." In battleships, where the design of the compartments has required that the forced-draft blowers be located at some remote place as regards the fire-room floor, the use of telegraphs was occasioned for the purpose of producing more or less draft as the conditions might demand. The regular fire-room telegraph has been requisitioned for this object with naturally its dial readings changed to those which would follow from the application. The signals indicate to the operators at the blowers to increase or decrease the speed of the motors. Electric motors are now the prime movers for these auxiliaries instead of steam engines. Mechanical gongs and jingle bells for the operation of the anchor windlass engine, ash hoists, and on the transfer platforms of the turrets complete the signals that are not either electrical or electro-mechanical, if the latter classification include the voice-tube system.

(To be continued.)

TWO LAKE LAUNCHINGS.

The steamer G. A. Tomlinson, building for Capt. J. J. H. Brown, of Buffalo, was launched from the Lorain yard of the American Ship Building Co. on July 10 and was christened by Mrs. G. A. Tomlinson in honor of her husband. Immediately after the launching the launching party adjourned to the Clifton Club where luncheon was served and where speeches were made by Thomas F. Cole, formerly president of the Oliver Iron Mining Co., President William Livingstone, of the Lake Carriers' Association, Capt. J. J. H. Brown, of Buffalo, Robert Wallace and Russell C. Wetmore. The new steamer is 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep.

The steamer J. S. Ashley was also launched from the Lorain yard on July 3 and was distinguished by the fact that the affair was exclusively stag, the vessel being christened by Mr. Ashley personally. Mr. Ashley is the seventh person associated with the firm of M. A. Hanna & Co. to have a vessel named after him. The Ashley also is in the 524 ft. class. Those who attended the launching voted the stag arrangement to have been most successful.

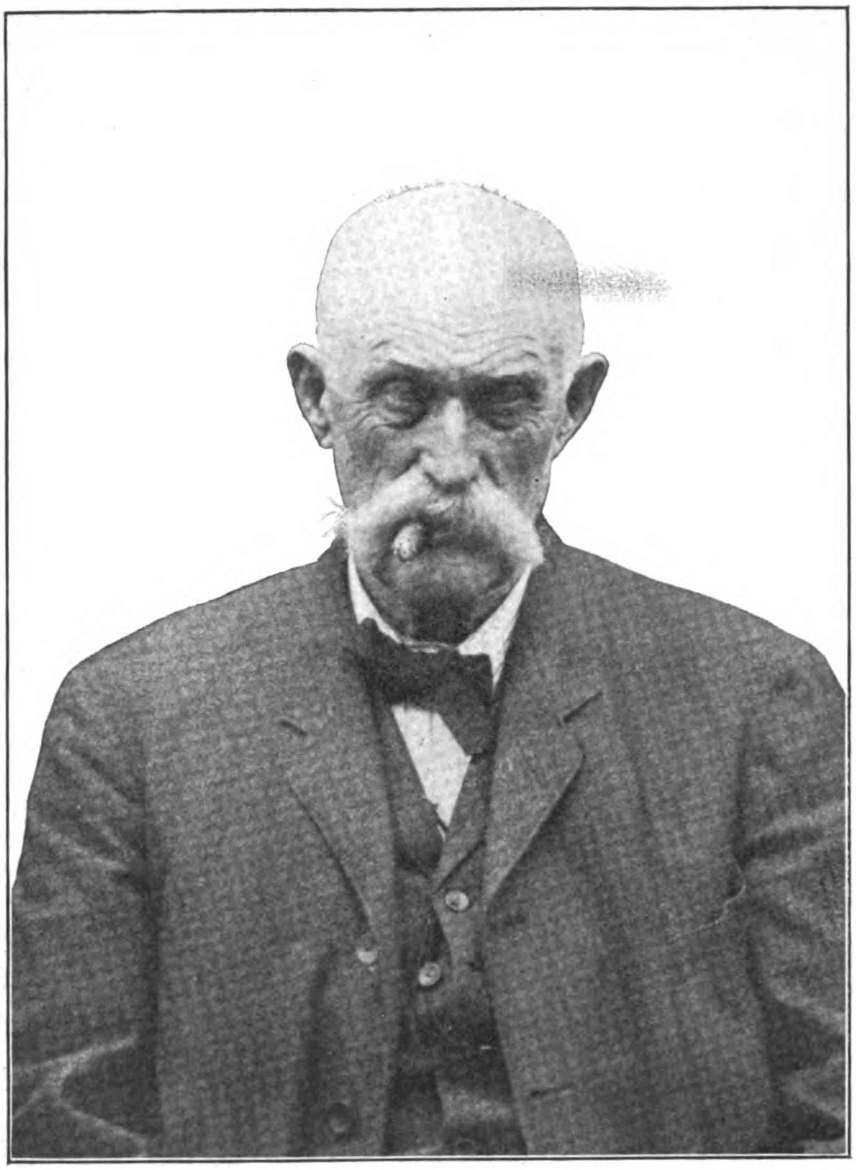
CONTRACTS FOR LAKE VESSELS.

The American Ship Building Co. has booked an order for a bulk freighter to be 524 ft. long, for 1910 delivery. The name of the contracting parties is withheld. The American Ship Building Co. has also received an order from the Anchor line for a duplicate of the Juniata to come out next year. She will be 360 ft. over all, 340 ft. keel, 45 ft. beam, and will have quadruple-expansion engines and Scotch boilers. Other contracts are pending and additional announcements may be expected at any time.

Another remarkable unloading feat was recently accomplished at the Conneaut ore docks, when on Saturday, June 10, two cargoes of 19,999 tons were taken out in 11 hours. Work was started on the Pittsburg Steamship Co.'s steamer William E. Corey at 7:15 p. m. She had 9,935 tons of ore in her hold, which was unloaded in 4 hours and 15 minutes. The Corey was followed at the dock by the steamer Frank C. Ball and her cargo of 10,064 tons was taken out in 5 hours and 45 minutes. The Ball left the dock at 6:15 Sunday morning. The work was done by four Huletts and four Brown electric machines.

CAPT. TOM COE.

Lord Mortimer Coe, better known as Capt. Tom Coe, died at his home at No. 4719 Euclid avenue, Cleveland, Monday evening, Aug. 2, at the age of 80 years. Until five weeks ago, when he was striken with a trifling illness, he had been continuously active in business for over 60 years. In Cleveland it is safe to say that no man was better known or more greatly beloved. He employed a rough exterior to hide a tenderness that is rare among men. He did not deceive the discerning however and probably no man in Cleveland received more personal petitions for aid and no man turned less of them away. There are hundreds that can testify to his helpfulness secretly administered. His chivalry was rough but it was of the purest kind. His personal characteristics were pronounced and unchanging. He might be seen any day leaning forward in his buggy driving his old mare. She was as familiar with the streets of Cleveland as the oldest inhabitant, and carried her master with unfailing fidelity from the home to the forge and to the various down town business interests with which he was associated as an investor or director.



Lord Mortimer Coe.

That his name was not Tom at all but Lord Mortimer was a surprise to everyone. No one knew how he came to be called Tom but it is likely that he christened himself Tom, probably regarding Lord Mortimer as altogether too aristocratic for his plain and simple nature; for Tom Coe was a democrat among democrats.

On Sundays he invariably drove out to the Euclid club and told his famous story of the wreck of the Sebastopol to a coterie who always loved to listen to it. It cannot be told in print very well, the framework of it being garnished elaborately with the captain's picturesque language, but nevertheless it was always a rare morsel to his old friends and grew more unctuous and mellow as it grew older. For 40 years Tom Coe's personal appearance never varied so much as by the breadth of an eye lash—the stern uncompromising face, the gruff voice, the stub of a cigar in the corner of his mouth, the incessant striking of matches in the vain effort to keep it lighted, the flow of copious and extraordinary diction—these were the mannerisms familiar to all, which concealed rather than revealed his real nature.

Capt. Coe was directly descended from Robert Coe, who came to this country from England in 1630 and was one of the founders of New Haven, Conn. Capt. Coe's great grandfather, whose name was also Robert Coe, was the second United States senator from Connecticut. Capt. Coe's father was Col. John Coe of the United States army. Capt. Coe was born at Penn Yan, N. Y., Nov. 14, 1828, and was educated in the private schools of that city. As a boy he went to Buffalo and learned the trade of machinist. Later he was attracted to the lakes and served as engineer on a number of lake vessels.

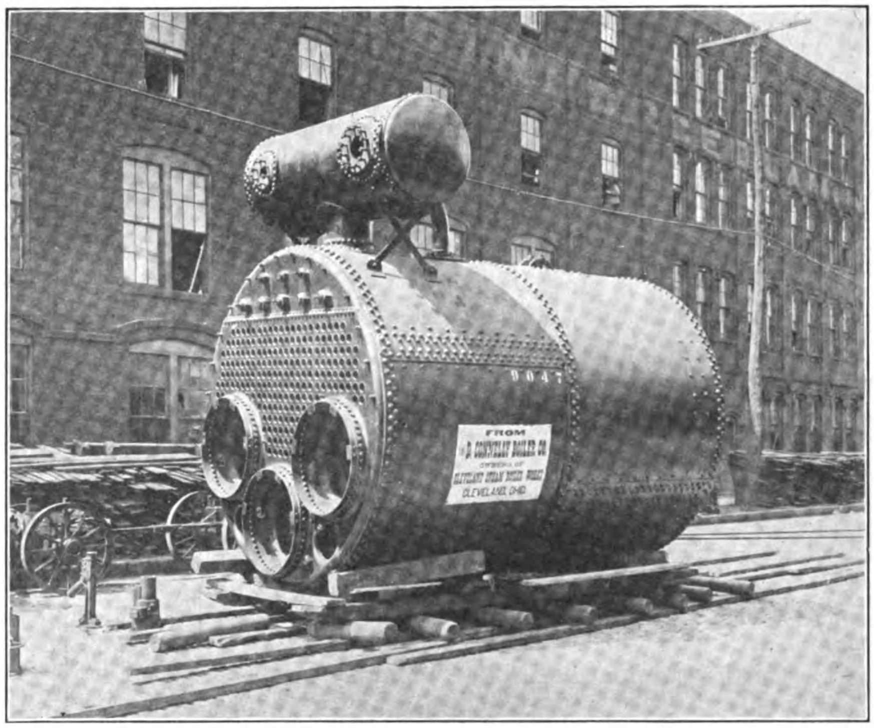
In 1854 Henry Chisholm, William Chisholm and Amasa Stone, who were engaged in contracting work in Cleveland, decided to enter the lake trade and built the steamer Sebastopol. On her maiden trip the Sebastopol carried 200 passengers, 100 horses and a miscellaneous cargo of freight at a rate that guaranteed the return of the original investment before the season was over. In a dense fog, however, the Sebastopol went ashore off Milwaukee and pounded to pieces, becoming a total wreck. William Chisholm was clerk of the boat and Tom Coe chief engineer. The horses were driven overboard and swam ashore. Lines were thrown from the rigging to the shore and the passengers conveyed to safety in a breeches buoy. This operation was superintended by Tom Coe with the vigorous assistance of his tongue. When William Chisholm appeared from the ship's hold staggering under the weight of a great parcel Tom shouted: "William, what have you there?" "The ship's books," replied William. "To hell with the ship's books," said Tom. "Save yourself, William". But William clung tenaciously to the ship's books and would not part with them. All

this, and many more details of human interest, Coe would relate with great gusto 50 years later. In fact the wreck of the Sebastopol marked a turning point in the life of the Chisholms. Capt. Coe always insisted that they would have made money in it had they remained in it, but the Sebastapol was only partly insured and they lost money on this single venture. Amasa Stone and the Chisholms went out of the vessel business permanently and turning their attention to iron established the Newburgh Rolling Mills which later became an important part of the American Steel & Wire Co.

Capt. Coe was a natural mechanic and in 1861 established a small forge in the flats at Cleveland to turn out marine forgings, the firm name being Coe, Harman & Ely. The business thrived from the start and later became known as the Cleveland City Forge & Iron Co. Today it is one of the leading industries of the country in the manufacture of marine forgings of the heaviest character though marine forging is now only a part of its business. Probably more of the heavy forgings for marine work on both coasts and the lakes and for the navy were made by it, than by any other concern in the country.

Capt. Coe's business interests were extensive. He was a director of the Lehigh Valley Railroad Co., trustee of the Society of Savings, member of the advisory board of the Citizens Savings & Trust Co. He was also a member of many clubs including the Euclid Club, Country Club, Cleveland Yacht Club, Castalia Trout club and the Cleveland Chamber of Commerce.

Capt. Coe is survived by a widow and a son, Ralph M. Coe.



SCOTCH BOILER OF THE FIREBOAT JOHN H. FARLEY.

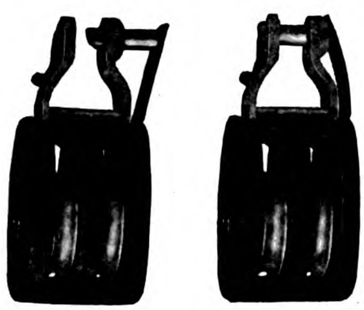
BOILER OF FIRE TUG J. H. FARLEY.

The D. Connelly Boiler Co., West street, Cleveland, recently installed a new Scotch boiler in the fire tug John H. Farley. The new boiler is 10 ft. in diameter and 14 ft. 4 in. long, containing three Morrison corrugated furnaces, each 38 in. inside diameter and 12 ft. 6 in. long. The boiler has 194 return tubes 3 in. by 12 ft. The steam drum is 36 in. in diameter and 8 ft. long. The boiler is built for 150 lbs. working pressure. This boiler replaces one that was built 23 years ago by D. Connelly. The old boiler was practically of the same diameter and length as the new one but the new one contains about 25 per cent more heating surface and is built to carry 50 lbs. more steam pressure.

RELEASING DEVICE FOR LIFE BOATS.

David Kahnweiler's Sons, 260 Front street, New York, are sole agents for Wick's patent releasing device for life boats, which has been approved by the board of supervising inspectors of steam vessels.

As shown in the above illustration when the life boat is resting in the



chocks the sliding bolt is held in place by a thumb catch. In launching a boat just as soon as the weight of the boat is on the sliding bolt the thumb catch is removed, in which case the bolt remains in position until the boat is waterborne, when it automatically springs out of the way, releasing the boat immediately. The thumb catch is for the same purpose as the mousing of a hook, and prevents the automatic device from operating before it is desired. This device brings the block closer to the boat than in any other way, which means that there is more distance between the upper and lower blocks for hoisting, or that the davits need not be so high in order to give the requisite clearance. All iron parts of the device are galvanized, and all working parts are of bronze, so that there is no danger that rust will interfere with proper operation.

The blocks furnished with this device are first-class, with galvanized iron sheaves having bronze rolls (ligumvitae sheaves can be furnished when preferred). The device is not furnished separate from blocks.

NEW SHIP BUILDING PLANT FOR PORT ARTHUR.

The large dry dock and ship building plant which it has been announced would be established at Port Arthur, Ont., by the American Ship Building Co., of Cleveland, is to be operated by the Western Dry Dock & Ship Building Co.

Officials of the American Ship Building Co. have come to terms with those of the city of Port Arthur and it now remains for the property owners to vote upon the proposition. This will be done Aug. 10 and should the vote be in favor of the enterprise, work will be begun at once upon the erection of the plant.

It is estimated that the new yard will cost $700,000 and it is to be one of the most complete anywhere on the lakes, the plans calling for a 700-ft. dry dock—big enough to handle any existing lake vessel—as well as for complete equipment for the construction of ships.

The members of the city council of Port Arthur have agreed to give the ship building company 100 acres of land and to pay a bonus of $25,000 a year for 10 years. Exemption from taxes is also agreed upon for 20 years, with the exception of $2,000 a year for school purposes.

W. L. Brown, of Chicago, chairman of the board of directors, Robert Logan, of Cleveland, general manager, and A. B. Wolvin, of Duluth, member of the board of directors, conducted the negotiations on behalf of the American Ship Building Co.

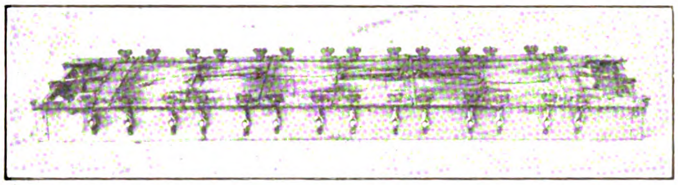


FIG. 1—SHOWING THE HATCH COVER IN POSITION.

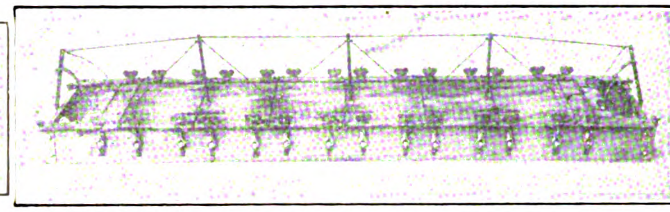


FIG. 2—PREPARING TO REMOVE COVER.

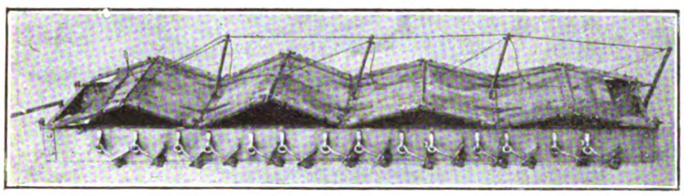


FIG. 3—THE SECTIONS BEGINNING TO FOLD.

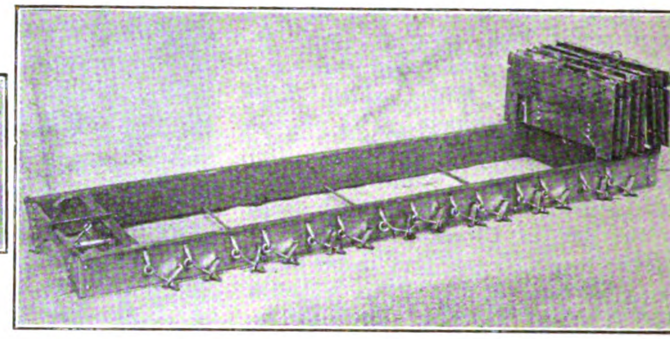


FIG. 4—THE HATCH OPEN AND COVER FOLDED.

NOVEL FORM OF HATCH COVER.

Herewith are given illustrations of an entirely novel form of hatch cover designed by G. H. Tackman, 47 Bryan place, Chicago for which application for patent is now pending. Fig. 1 shows the hatch clamped down. Any make of hatch fastener may be employed. It is operated by cable, either to port or starboard, the rods as shown in Fig. 2 having only one purpose—that is to break the joint. Fig. 3 shows the hatch cover in process of folding and Fig. 4 shows it folded, leaving the hatch clear. The hatch cover is rubber jointed and is waterproof without the aid of tarpaulins. Secured to the lower surface of the sections at the ends are marginal packing strips which form a perfectly air and watertight seam around the hatch covers. Off-setting devices are provided to protect this packing strip while the covers are being folded and moved. A small extension is provided at each end of the hatch coamings to receive the folded covers, leaving the entire hatch opening clear for working purposes.

FREIGHTER COWLE SUNK.

The steel freighter John B. Cowle was sunk in collision with the bulk freighter Isaac M. Scott about two miles off Whitefish Point lighthouse on July 12 in a dense fog. The Scott had just passed the point on her maiden trip and had straightened out on her course when the Cowle loomed out of the fog directly broadside on. The ships were so close that it was impossible to avoid impact, the bow of the Scott cutting the Cowle squarely. The Cowle was laden with 7,000 tons of ore and soon sank under the weight of water, taking 14 members of her crew down with her. The rest were picked up out of the water by the Scott and the Goodyear which was in the neighborhood. The Scott returned to Sault Ste. Marie for temporary repairs. The Cowle was built in 1902 by the Jenks Ship Building Co., at Port Huron, and was insured for $275,000.

SAULT STE. MARIE CANAL COMMERCE.

During July 8,706,666 tons of freight were moved through the canals at Sault Ste. Marie, making a total to August 1 of 20,824,033 tons, an increase of 7,733,559 tons over the corresponding period of last year. The July movement has been exceeded only once in the history of the canal, when 8,865,442 tons were moved through the canal in June, 1907. Following is the summary:

	To Aug. 1, 1908.	To Aug. 1, 1909.
EAST BOUND.		
Copper, net tons	35,960	51,945
Grain, other than wheat, bushels	11,241,349	11,324,761
Building stone, net tons	577	980
Flour, barrels	1,714,693	2,393,394
Iron ore, net tons	7,106,322	14,540,764
Pig iron, net tons	7,620	11,374
Lumber, M. ft. B. M.	182,792	223,122
Wheat, bushels	27,846,529	23,088,460
Unclassified freight, tons	36,643	70,522
Passengers, number	12,196	12,936
WEST BOUND.		
Coal, hard, net tons	643,633	629,981
Coal, soft, net tons	3,225,818	3,315,236
Flour, barrels	265	1,550
Grain, bushels	700	500
Manufactured iron, net tons	113,435	198,437
Iron ore, net tons	....	5,826
Salt, barrels	261,978	364,142
Unclassified freight, tons	308,737	406,225
Passengers, number	12,975	13,858
SUMMARY OF TOTAL MOVEMENT.		
East bound, tons	8,759,790	16,213,999
West bound, tons	4,330,684	4,610,034
	13,090,474	20,824,033

IRON ORE SHIPMENTS.

Notwithstanding cloudbursts and washouts on the ranges which crippled Duluth and Ashland for a week in July, the ore shipments of that month were 6,693,025 tons, which is the second largest shipment of any month in the history of the trade, the record being made in August, 1907, when 6,806,810 tons were moved. As ore is now moving with wonderful celerity it is expected that the present month will establish a new record. Shipments to Aug. 1 show an increase of 8,160,069 tons over the corresponding period last year and are within 2,139,391 tons of the record shipments of 1907. No difficulty whatever will be experienced in equaling or eclipsing the 1907 record. It looks now as if it would be surpassed, the present intention of shippers being to move as much ore as they can. There could be no better indication of a resumption of prosperity than this. Following are the figures:

	July, 1907.	July, 1908.	July, 1909.
Escanaba	988,664	483,552	884,271
Marquette	580,746	226,775	450,736
Ashland	657,750	321,361	449,163
Superior	762,753	633,224	1,111,533
Duluth	1,057,319	1,655,125	2,249,410
Two Harbors	801,885	1,044,246	1,547,912
Total	4,849,117	4,364,283	6,693,025
Increase of 1909 over 1908			2,328,742

	To Aug. 1, 1907.	To Aug. 1, 1908.	To Aug. 1, 1909.
Escanaba	2,812,879	754,293	2,016,505
Marquette	1,349,805	345,789	870,961
Ashland	1,707,107	592,939	1,061,187
Superior	3,081,664	1,111,887	2,576,110
Duluth	5,151,365	2,819,934	5,434,135
Two Harbors	3,431,921	1,610,439	3,436,452
Total	17,534,741	7,235,281	15,395,350
Increase of 1909 over 1908			8,160,069

LEHIGH VALLEY TRANSIT CO. CHANGES.

The Lehigh Valley Transit Co., which is the lake end of the Lehigh Valley railroad and has hitherto been a part of the Buffalo division, has been erected into a separate division, of which F. G. Rogers is general superintendent, reporting to the general manager instead of to the division superintendent, as formerly.

Collector of Customs L. M. Willcuts, of Duluth, has placed fines of $200 each against the steamer North West, for violations of the rule relative to the blowing of whistles in the St. Mary's river; also against the steamer Oscar Flint for violations of the same rule, and against the steamer Sonoma for violating the speed limit in the St. Mary's river. The violations were reported to the inspector by the revenue cutter Mackinac. The revenue cutter Tuscarora has reported that the gasoline launch Thor carried no bell and a fine of $200 was placed against her; the Tuscarora also reported that the steamer Mayflower was being run by an engineer whose papers permitted him to run a boat of 10 tons or less and a fine of $500 was assessed against her. The steamer Japan was also referred to the collector at Erie, Pa., it having been learned that she was not carrying an official number card.

Capt. W. A. Boswell, of Benton Harbor, died at his home there July 17. He had sailed the steamer Puritan, of the Graham & Morton line, since she was built in 1901, leaving her only a few days before his death. He was one of the best known passenger steamboat captains on Lake Michigan.

STANDARD SPECIFICATIONS FOR OPEN-HEARTH BOILER PLATE AND RIVET STEEL.

1. Steel shall be made by the open-hearth process.

2. There shall be three classes of open-hearth boiler plate steel; namely, flange steel, fire box steel and extra soft steel, which shall conform to the following limits in chemical and physical properties:

(d) The homogeneity test is made as follows: A portion of the broken tensile test specimen is either nicked with a chisel or grooved on a machine, transversely about $\frac{1}{16}$-inch deep in three places about 2 inches apart. The first groove should be made on one side, 2 inches from the square end of the specimen; the second, 2 inches from it on the opposite side; and the third, 2 inches from the last, and on the opposite side from it. The test specimen is then put in a vise, with the first groove about ¼-inch above the jaws, care being taken to hold it firmly. The projecting end of the test specimen is then broken off by means of a hammer, a number of light blows being used, and the bending being away from the groove. The specimen is broken at the other two grooves in the same way. The object of this treatment is to open and render visible to the eye any seams due to failure to weld up, or to foreign interposed matter, or cavities due to gas bubbles in the ingot. After rupture, one side of each fracture is examined, a pocket lens being used if necessary, and the length of the seams and cavities is determined.

	Flange steel.	Fire box steel.	Extra soft steel.
Phosphorus shall not exceed......	Acid 0.06 per cent Basic 0.04 per cent	Acid 0.04 per cent Basic 0.03 per cent	0.04 per cent
Sulphur shall not exceed.........	0.05 per cent	0.04 per cent	0.04 per cent
Manganese	0.30 to 0.60 per cent	0.30 to 0.50 per cent	0.30 to 0.50 per cent
Ult. tensile strength, pounds per square inch	55,000—65,000	52,000—62,000	45,000 to 55,000
Yield point, in pounds per square inch, shall not be less than.....	½ Ult. tens. str.	½ Ult. tens. str.	½ Ult. tens. str.
Elongation, per cent in 8 inches, shall not be less than..........	$\frac{1,500,000}{\text{Ult. tens. str.}}$	$\frac{1,500,000}{\text{Ult. tens. str.}}$	$\frac{1,500,000}{\text{Ult. tens. str.}}$ (but need not exceed 30 per cent)
Cold bend .... Quench bend	180° flat.	180° flat.	180° flat.

(a) For the purposes of these specifications, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gage of the testing machine.

3. Steel for boiler rivets shall be of the extra soft class, as specified in paragraph 2.

4. For material less than $\frac{5}{16}$-inch and more than ¾-inch in thickness, the following modifications shall be made in the requirements for elongation.

(b) For each increase of ⅛-inch in thickness above ¾-inch a deduction of 1 shall be made from the specified percentage of elongation.

(c) For each decrease of $\frac{1}{16}$-inch in thickness below $\frac{5}{16}$-inch, a deduction of 2½ shall be made from the specified percentage of elongation.

5. In order to determine if the material conforms to the chemical limitations prescribed in paragraph 2 herein, analysis shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. A check analysis may be made by the purchaser or his representative, from a broken tensile test specimen representing each heat of flange or extra soft steel on an order, and for each plate as rolled of fire box steel, in which cases an excess of 25 per cent above the required limits in phosphorus and sulphur will be allowed.

6. The standard tensile test specimen of 8-inch gaged length shall be used to determine the physical properties specified in paragraphs 2 and 3. The standard shape of the tensile test specimen for sheared plates shall be as shown in Fig. 1.

For other material the tensile test specimen may be the same as for sheared plates, or it may be planed or turned parallel throughout its entire length and in all cases where possible two opposite sides of the test specimens shall be the rolled surfaces.

Rivet rounds and small rolled bars shall be tested of full size as rolled.

7. The bending test specimen shall be 1½ inches wide, if possible, and for all material ¾-inch or less in thickness the test specimen shall have the natural rolled surface on two opposite sides; but for material more than ¾-inch thick, the bending test specimen may be ½-inch thick. The sheared edges of bending test specimens shall be milled or planed. The bending test may be made by pressure or by blows. The cold bending test shall be made on the material in the condition in which it is to be used, and prior to the quenched bending test, the specimen shall be heated to a light cherry red as seen in the dark and quenched in water, the temperature of which is between 80 degrees and 90 degrees Fahr.

Rivet rounds shall be tested of full size as rolled.

8. For fire box steel a sample taken from a broken tensile test specimen shall not show any single seam or cavity more than ¼-inch long, in either of the three fractures obtained on the test for homogeneity, as described below:

9. Three test pieces shall be furnished from each plate as it is rolled; one for tension, one for cold bending and one for quench bending test. For rivet rods, two

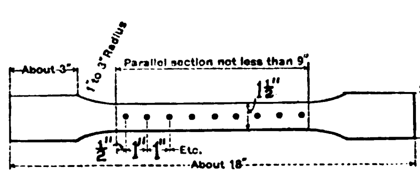


FIG. 1.

tensile test specimens and two cold bending and two quench bending test specimens shall be furnished from each melt. In case any one of these develop flaws, or should a tensile test specimen break outside of the middle third of its gaged length, it may be discarded and another test specimen substituted therefor.

10. A variation in cross-section or weight of each piece of steel of more than 2½ per cent from that specified will be sufficient cause for rejection, except in case of sheared plates, which will be covered by the following permissible variations, which are to apply to single plates.

PLATES ¼ INCH AND OVER IN THICKNESS.

Thickness ordered, inches.	Nominal weights. Lbs. per sq. ft.	Width of Plate. Up to 75 in.	75 in. and up to 100 in.	100 in. and up to 115 in.	Over 115 in.
¼	10.20	10 per cent	14 per cent	18 per cent	
$\frac{5}{16}$	12.75	8 per cent	12 per cent	16 per cent	
⅜	15.30	7 per cent	10 per cent	13 per cent	17 per cent
$\frac{7}{16}$	17.85	6 per cent	8 per cent	10 per cent	13 per cent
½	20.40	5 per cent	7 per cent	9 per cent	12 per cent
$\frac{9}{16}$	22.95	4½ per cent	6½ per cent	8½ per cent	11 per cent
⅝	25.50	4 per cent	6 per cent	8 per cent	10 per cent
Over ⅝	.....	3½ per cent	5 per cent	6½ per cent	9 per cent

PLATES UNDER ¼ INCH IN THICKNESS.

Thickness ordered, inches.	Nominal weights. Lbs. per sq. ft.	Width of Plate. Up to 50 in.	50 in. and up to 70 in.	Over 70 in.
⅛ up to $\frac{5}{32}$	5.10 to 6.37	10 per cent	15 per cent	20 per cent
$\frac{5}{32}$ up to $\frac{3}{16}$	6.37 to 7.65	8½ per cent	12½ per cent	17 per cent
$\frac{3}{16}$ up to ¼	7.65 to 10.20	7 per cent	10 per cent	15 per cent

WHEN ORDERED TO WEIGHT.

Plates 12½ pounds per square foot or heavier:

(e) Up to 100 inches wide, 2½ per cent above or below the prescribed weight.

(f) 100 inches wide and over, 5 per cent above or below.

Plates under 12½ pounds per square foot:

(g) Up to 75 inches wide, 2½ per cent above or below.

(h) 75 inches and up to 100 inches wide, 5 per cent above or 3 per cent below.

(i) 100 inches wide and over, 10 per cent above or 3 per cent below.

WHEN ORDERED TO GAGE.

Plates will be accepted if they measure not more than 0.01 inch below the ordered thickness.

An excess over the nominal weight corresponding to the dimensions on the order will be allowed for each plate, if not more than that shown in the following tables, one cubic inch of rolled steel being assumed to weigh 0.2833 pound.

11. Each plate shall be distinctly stamped with its heat or slab number, and with the name of the manufacturer, grade and lowest tensile strength specified. Each test specimen shall be distinctly stamped with the heat or slab number which it represents.

Rivet steel may be shipped in securely fastened bundles with the melt number stamped on a metal tag, attached.

12. All finished material shall be free from injurious surface defects and laminations, and must have a workmanlike finish.

13. The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture, prior to shipment.

CADILLAC SUNK.

The steamer Cadillac, of the Cleveland-Cliffs Iron Co.'s fleet, was sunk in collision with the steamer George L. Craig in St. Clair flats opposite Bedore's hotel on Aug. 1. The collision appears to have been a three-cornered affair, the Mariposa of the Pittsburg Steamship Co.'s fleet endeavoring to pass the Cadillac, both up bound, and throwing the Cadillac's bow in the pathway of the Craig, down bound. The Cadillac, coal laden, sank at once. Capt. Harris W. Baker, the wrecker, was given the contract for raising the Cadillac. The Craig proceeded to Ashtabula where she unloaded her cargo of ore and then went to Cleveland for repairs. Her injuries were all above the water line.

The large and comfortable steamer City of St. Ignace is the special steamer of the D. & C. Mackinac division. This boat makes two trips weekly between Cleveland, Detroit and Mackinac, and with the two regular D. & C. steamers maintain a six-trips-a-week schedule to northern Michigan resorts. A stop is made at Goderich, Ont., once a week in each direction.

The Lake Carriers' Association has appointed John M. Mehringer, of Cleveland, shipping master at Lorain, and Capt. Sam Gould, who has been stationed there for some time, has gone upon a vacation prior to entering new duties.

STANDARD SPECIFICATIONS FOR STRUCTURAL STEEL FOR SHIPS.

1. Steel shall be made by the open-hearth process.

2. The chemical and physical properties shall conform to the following limits:

Properties considered.		Structural steel.	Rivet steel.	Steel castings.
Phosphorus, max.	Basic	0.04 per cent	0.04 per cent	0.05 per cent
	Acid	0.06 per cent	0.06 per cent	0.08 per cent
Sulphur, max.		....	0.05 per cent	....
Ult. tensile strength, lbs. per sq. in.		55,000-65,000	48,000-58,000	60,000 minimum
Yield point		½ Ult. tens. str.	½ Ult. tens. str.	½ Ult. tens. str.
Elong., min. per cent. in 8 in. (Fig. 1)		$\frac{1{,}500{,}000}{\text{Ult. tens. str.}}$	$\frac{1{,}500{,}000}{\text{Ult. tens. str.}}$	....
Elong. min. per cent in 2 in. (Fig. 2)			....	18
Character of fracture............		Silky	Silky	Silky or fine granular
Cold bend without fracture.......		180° flat.	180° flat	90° d = 3t

For the purpose of these specifications, the yield point shall be determined by the careful observation of the drop of the beam or halt in the gage of the testing machine.

3. In order to determine if the material conforms to the chemical limitations prescribed in paragraph 2 herein, analysis shall be made by the manufacturer from a test

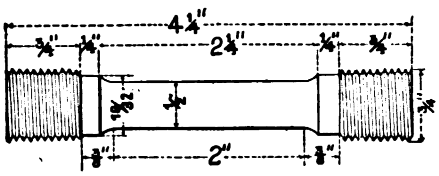


FIG. 2.

ingot taken at the time of the pouring of each melt of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector. A check analysis may be made by the purchaser or his representative if desired, in which case an excess of 25 per cent above the required limits will be allowed.

4. Specimens for tensile and bending tests for structural and rivet steel, shall be made by cutting coupons from the finished product, which shall have both faces rolled and both edges milled to the form shown by Fig. 1, page 2; or with both edges parallel; or they may be turned to a diameter of ¾-inch for a length of at least 9 inches, with enlarged ends.

(a) Rivet rounds and small rolled bars shall be tested as rolled.

5. The number of tests will depend on the character and importance of the castings. Specimens shall be cut cold from coupons molded and cast on some portion of one or more castings from each melt or from the sink heads, if the heads are of sufficient size. The coupon or sink-head so used shall be annealed with the casting before it is cut off. Test specimens shall be of the form shown by Fig. 2.

6. Material which is to be used without annealing or further treatment shall be tested in the condition in which it comes from the rolls. When material is to be annealed or otherwise treated before use, the specimens for tensile tests, representing such material, shall be cut from properly annealed or similarly treated short lengths of the full section of the bar.

7. At least one tensile and one bending test shall be made from each melt of steel as rolled. In case steel differing ⅜-inch and more in thickness is rolled from one melt, a test shall be made from the thickest and thinnest material rolled. Should either of these test specimens develop flaws, or should the tensile test specimen break outside of the middle third of its gaged length, it may be discarded and another test specimen substituted therefor In case a tensile test specimen does not meet the specifications, additional tests may be made.

8. For material less than 5/16-inch and more than ¾-inch in thickness the following modifications will be allowed in the requirements for elongation:

(b) For each 1/16-inch in thickness below 5/16-inch, a deduction of 2½ will be allowed from the specified percentage.

(c) For each ⅛-inch in thickness above ¾-inch, a deduction of 1 will be allowed from the specified percentage.

9. Plates, shapes and bars less than ¾-inch thick shall bend as called for in paragraph 2.

(d) Steel ¾-inch to 1¼ inches thick, inclusive, tested as rolled, shall bend cold 180 degrees around a pin the diameter of which is equal to one and one-half times the thickness of the bar, without fracture on the outside of bend.

(e) Steel over 1¼ inches thick, tested as rolled, shall bend cold 180 degrees around a pin the diameter of which is equal to twice the thickness of the bar, without fracture on the outside of bend.

(f) Bending tests may be made by pressure or by blows.

10. Angles ¾-inch and less in thickness shall open flat, and angles ½-inch and less in thickness shall bend shut, cold, under blows of a hammer, without sign of fracture. This test will be made only when required by the inspector.

11. Finished material shall be free from injurious seams, flaws, cracks, defective edges, or other defects, and shall have a smooth, uniform, workmanlike finish.

12. Test specimens and every finished piece of steel shall be stamped with the melt number, except that small pieces may be shipped in bundles securely wired together, with the melt number on a metal tag attached.

13. A variation in cross section or weight of each piece of steel of more than 2½ per cent from that specified will be sufficient cause for rejection, except in case of sheared plates, which will be covered by the following permissible variations, which are to apply to single plates.

PLATES ¼ INCH AND OVER IN THICKNESS.

Thickness ordered. Inches.	Nominal weights Lbs. per sq. ft.	Width of plate. Up to 75 ins.	75 ins. and up. to 100 ins.	100 ins. and up to 115 ins.	.... Over 115 ins.
¼	10.20	10 per cent	14 per cent	18 per cent	
5/16	12.75	8 per cent	12 per cent	16 per cent	
⅜	15.30	7 per cent	10 per cent	13 per cent	17 per cent
7/16	17.85	6 per cent	8 per cent	10 per cent	13 per cent
½	20.40	5 per cent	7 per cent	9 per cent	12 per cent
9/16	22.95	4½ per cent	6½ per cent	8½ per cent	11 per cent
⅝	25.50	4 per cent	6 per cent	8 per cent	10 per cent
Over ⅝	.....	3½ per cent	5 per cent	6½ per cent	9 per cent

PLATES UNDER ¼ INCH IN THICKNESS.

Thickness ordered. Inches.	Nominal weights. Lbs. per sq. ft.	Width of plate. Up to 50 ins.	50 ins. and up to 70 ins.	Over 70 ins.
⅛ up to 5/32	5.10 to 6.37	10 per cent	15 per cent	20 per cent
5/32 up to 3/16	6.37 to 7.65	8½ per cent	12½ per cent	17 per cent
3/16 up to ¼	7.65 to 10.20	7 per cent	10 per cent	15 per cent

WHEN ORDERED TO WEIGHT.

Plates 12¾ pounds per square foot or heavier:

(g) Up to 100 inches wide, 2½ per cent above or below the prescribed weight.

(h) 100 inches wide and over, 5 per cent above or below.

Plates under 12¾ pounds per square foot:

(i) Up to 75 inches wide, 2½ per cent above or below.

75 inches and up to 100 inches wide, 5 per cent above or 3 per cent below.

(j) 100 inches wide and over, 10 per cent above or 3 per cent below.

WHEN ORDERED TO GAGE.

Plates will be accepted if they measure not more than 0.01 inch below the ordered thickness.

An excess over the nominal weight corresponding to the dimensions on the order, will be allowed for each plate, if not more than that shown in the following tables, one cubic inch of rolled steel being assumed to weigh 0.2833 pound.

14. The inspector representing the purchaser shall have all reasonable facilities afforded to him by the manufacturer to satisfy him that the finished material is furnished in accordance with these specifications.

The manufacturer shall furnish a suitable testing machine for testing the specimens, as well as prepare the pieces for the machine, free of cost.

All tests and inspections shall be made at the place of manufacture, prior to shipment.

TRADE NOTES.

David Kahnweiler's Sons have removed their offices to 260 Front street, cor. Dover street, New York.

Dean Bros., Indianapolis, Ind., have just put out a catalog describing their hydraulic pressure pumps.

The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a tasty booklet on the proper care of belts.

C. W. Hunt Co., West New Brighton, New York, have issued a bulletin devoted to their mast gaff automatic railway for the retail dealer.

The H. E. Boucher Manufacturing Co. announce the removal of their office and shops from 91 Maiden Lane to 20 Fulton street, New York.

Henry J. Gielow, engineer and naval architect, has removed to 52 Broadway, New York, one door north of his former address.

The Independent Pneumatic Tool Co. have removed their general office from the First National Bank building, Chicago, to the new Thor building at 1307 Michigan av., Chicago.

C. O. Bartlett & Snow Co., Cleveland, have just issued catalog No. 28, descriptive of their coal and ash handling machinery. The catalog contains descriptions of the various fueling devices which this company has installed at lake ports during the past few years.

The Falls Hollow Staybolt Co., Cuyahoga Falls, O., recently received a large order for Falls Hollow Staybolt iron from one of the largest railway systems in England. The order is in the nature of a preliminary test, with a view of its adoption on their entire system.

The American Bitumastic Enamels Co., 322 Delaware avenue, Philadelphia, Pa., sole agents in the United States for Bitumastic preparations for painting inner bottoms and bunkers of ships, are about to open branch offices in Cleveland and other points on the great lakes. This company has offices in New York and San Francisco and has done considerable work along the coasts, having the distinction of having coated the entire internal surfaces of all the ships belonging to the Cunard line, the International Mercantile Marine Co., and the American-Hawaiian line, as well as the inland passenger steamers Robert Fulton, Princeton, Trojan and Rensselaer. The turbine steamers Yale and Harvard, of the Metropolitan line, and the Governor Cobb, Belfast and Calvin Austin, of the Eastern Steamship Co., are coated with patent Bitumastic commodities. The preparation is also extensively used on government vessels, having been applied on the dredges Culebra, Ancon, Galveston and Savannah, 10 mine boats and four mine planters for the quartermaster's department, and the colliers Mars, Vulcan and Hector. This firm has been awarded by the Franco-British exhibiton two gold medals in classes pertaining to the mercantile marine and civil engineering for excellence as preservatives for valuable iron and steel structures from corrosion, and have also received diplomas of honor from the Glasgow East End exposition in 1904 and the Milan exposition in 1906.

SEALED PROPOSALS will be received at the office of the Light-House Board, Washington, D. C., until 2 o'clock p. m., September 10, 1909, and then opened, for furnishing the materials and labor of all kinds necessary for the construction, equipment and delivery of the twin-screw, steel, steam light-house tender Camellia, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to the Light-House Board, Washington, D. C.